

SUPPLEMENT

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Section VIII.—Neurology and Psychiatry. (Continued.)

VENEREAL DISEASE AND THE ABNORMAL MIND.

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IN accordance with the policy of this Section of the Congress to concentrate on the subject of congenital mental deficiency and the prevention of its increase in our community, I have selected for my contribution the subject of the association between venereal disease and the abnormal mind, in the hope that I may add to the general argument that something must be done to lessen the number of individuals with subnormal intelligence in our midst. By the term "subnormal intelligence" I mean all those individuals whose mental equipment has been damaged by an attack of acquired insanity, and those who have been born with a brain deficient in those elements which subserve the function of intelligence. Acquired insanity may be briefly ascribed to physical ill-health interfering with the nutrition of the brain cells of those individuals who have inherited vulnerability of the neurone. This means that a person who comes from a family in which there is insanity must keep physically well to avoid the risk of a mental breakdown. Worry and grief are potent factors in the production of insanity, as they disturb the general health of the body by their influence upon the digestion and other bodily functions. This liability to mental disease varies in proportion to the degree of vulnerability present.

In congenital insanity, known as idiocy, imbecility and congenital mental deficiency, the mental symptoms are due to defective brain structure present from birth or shortly after birth, which prevents the child from acquiring knowledge in the ordinary course of growing up. The word idiot is an old one meaning uninformed or unlearned, which aptly describes the mental condition in these cases.

A frequently debated subject amongst psychiatrists is the question as to what extent venereal disease, particularly syphilis, is associated with the abnormal mind, either as cause or effect. The term abnormal mind is here used in a broad sense to include not only certifiable persons but all individuals who by their behaviour, appearance,

speech or attitude to recognized social customs of the community they live in, may be regarded as abnormal. This category will include many eccentric geniuses in the arts and sciences, who are described by Dryden in the words:

Great wits are sure to madness near allied
And thin partitions do their bounds divide.

and others to whom Mercier's distinction of "insanity" as against "madness" may be well applied.

It also includes the various grades of congenital mental deficiency who follow such unskilled occupations as "bottle-o's," stable boys, fruit pickers *et cetera*.

Sometimes mental abnormality is the cause of the venereal disease and sometimes venereal disease is the cause of the mental abnormality through its action as a stress upon the brain cells.

Mental Abnormality as a Cause of Venereal Disease.

The outstanding feature of all kinds of mental abnormality is the want of self-restraint. This in sexual matters usually leads to promiscuity and venereal disease is sooner or later inevitable. The persons affected by the higher grades of congenital mental deficiency who are not segregated under the *Lunacy Act* because their harm to society is not obvious, are responsible for a considerable proportion of the spread of venereal disease. These individuals roam the country as tramps or occupy unsettled occupations where little intelligence is required or personal character and morality do not count as an asset. All congenital mental defectives, whether they be certified and living in segregation institutions, or uncertified mental defectives free to remain at large until they fall into the hands of the police for some transgression of the law, have the same peculiarity that their judgement and reasoning are overbalanced by their primitive organic instincts, which lead them to excesses and all manner of infractions of the laws of the society to which they belong. In other words they are deficient in the social instinct which is present in the normal mind. Workers in the stratigraphical examination of the brain cortex have shown that the sub-granular layer of the brain in the congenital mental defective is proportionately larger than the supra-granular layer. As the supra-granular layer is credited with being the brain tissue associated with the judgement, reasoning and those qualities which lift man above the level of the animals, and, as the sub-granular layer is credited with being associated with the organic and instinctive functioning, lack of self-control when the primitive appetites

urge, is not unexpected. In these individuals the sexual instinct is promiscuous and unrestrained, with the result that venereal disease is only a matter of time.

With few exceptions, such as in some cases of simple mania in which the mental symptoms although mild in character have included an exaltation of the *nisus generativus*, acquired insanity is not a fruitful source of venereal disease, because the patients are usually apprehended at an early stage on account of their mental symptoms. This is in most cases before they have had an opportunity to become infected. A person suffering from symptoms of well-established insanity is not likely to secure a partner for the sexual act as a rule, although occasionally one meets with instances where this has been encouraged by a wife or husband prompted by a belief that such treatment might be curative. In such marital intercourse infection is not likely to occur for the first time. Acquired mental diseases are prone to a solitary habit which is not conducive to mutual sexual practices, but rather to masturbation.

Venereal Disease as a Cause of Insanity.

Of the three varieties of venereal disease, namely, soft chancre, gonorrhœa and syphilis, the soft chancre in this country at least is not a frequent stress in the production of insanity. The pain and worry that accompany the bubo and sore might be severe enough in bad cases to cause a mental breakdown when the neurones of the individual suffered from inherited vulnerability, but in these days extensive bubo formation is comparatively rare owing to facilities for early treatment, so that the degree of stress is not sufficient to upset the health of the neurone either by toxic absorption from the bubo or general ill-health produced by worry and shame.

Gonorrhœa is so common in the community that it is not surprising to get an acknowledgment of previous gonorrhœa in 16% of the male patients in an acute mental hospital and in 50% of those in the hospitals for the insane. The difficulties of obtaining information under these conditions must be taken into account. Statistics based upon the unsupported statements of mental patients cannot be regarded as accurate, but if supported by clinical and *post mortem* evidence they may be accepted.

The complications of gonorrhœa are numerous and the sequelæ are the cause of much chronic ill-health. In the production of insanity long continued stresses rather than sudden ones appear to be the most important, so that as is in the case of gonorrhœa we may expect the mental symptoms to be para-gonorrhœal or late gonorrhœal in time rather than an accompaniment of the early phase of the disease.

Unfortunately the popular idea concerning gonorrhœa is that it is a trifling disease because its immediate symptoms are not often fatal. The chronic ill-health caused by such sequelæ as stricture of the urinary passages, chronic joint affections, chronic pelvic adhesions *et cetera* may cause a mental breakdown in those predisposed by inherited vulnerability of the neurones. In making *post mortem* examinations on the insane it is not uncommon to find the pelvic organs of a woman bound down by chronic adhesions so that normal functioning of bowel and generative organs during life was quite out of the question. Most of these pelvic adhesions are considered to be

gonorrhœal in origin. Norris in his work entitled "Gonorrhœa in Women," states that there is decidedly greater frequency of gynæcological disease in the insane than in the sane, the proportion being as 74% is to 47%, and gynæcological disease is said to be a fair index of the amount of gonorrhœa in a community. Norris states also that, although gonococcal nerve lesions are rare, the para-gonorrhœal are not and are more frequently found in men than in women. In his experience the mental symptoms vary from slight melancholia to severe mental disturbances and he thinks that there is a relationship between gonorrhœa and manic depressive insanity. As is the case in general hospitals, a history of past gonorrhœa is so frequently obtained in mental hospitals that it excites little comment in the absence of actual symptoms or sequelæ of the disease. Clinical and *post mortem* evidence of past gonorrhœa is found less in mental hospitals than in general hospitals.

In venereal diseases other than syphilis statistics taken in mental hospitals are inaccurate and if submitted could be easily challenged, as the knowledge concerning their accuracy is locked up in the forgotten past of demented patients. In syphilis, however, we can speak in more definite terms as there are a blood test and other means of determining the numbers insane through syphilis.

Syphilis is the most important of the venereal diseases in relation to the production of insanity. Syphilis causes insanity by damaging the brain cells either directly or indirectly. In the former case the spirochaetes or the products of their dead bodies destroy the brain cells and the brain wastes. In the latter or indirect method of affecting the brain, the syphilitic organism acts upon other parts of the body, the proper functionings of which are essential to the supply of healthy blood to the brain cells. Any one with uncured syphilis or even the results of cured syphilis in his body is carrying on life with a handicap, so that in the presence of a vulnerable neurone which is intolerant of the least interference with nutrition, mental disease follows.

In the year 1920 there were 474 deaths in the mental hospitals in Victoria and fifty of these or a little over 10% were from general paralysis of the insane, which is a form of syphilis. The question is how many of the other 424 owed their deaths to syphilis. The following may throw some light on the subject.

In the year 1922 out of one hundred and eighty-nine *post mortem* examinations made in the metropolitan area upon persons dying insane, changes of a syphilitic nature were found in one hundred and six. Of these one hundred and eighty-nine persons the blood had been examined by the Wassermann test in twenty-nine and a positive result was obtained in twenty-five.

An analysis of the *post mortem* findings in a large number of idiots showed changes similar to syphilis in 60%. It must be noted that these figures apply only to those dying insane with syphilis. It may indicate that syphilis *plus* insanity means incurable insanity.

The finding of syphilitic changes where syphilis was never suspected introduces the very important subject of occult or hidden syphilis which may account for a great deal of the unexpected syphilis found *post mortem* not only in mental hospitals, but in general hospitals and city

morgues. Occult syphilis must be distinguished from *syphilis insontium*, although a large proportion of the cases of occult syphilis are also *syphilis insontium*. The following is an example of occult syphilis.

A female patient was received into one of the mental hospitals in Victoria. She showed symptoms of general paralysis of the insane and the blood gave a confirmatory test. The husband claimed innocence in the matter and demanded that his own blood be examined to prove his statement. This was done, as was likewise the blood of the five children. The husband's blood did not yield a reaction, but that of three of the five children gave a reaction. The tests were made at the Pathological Laboratory of the Melbourne University. Subsequent investigation disclosed that when the patient's first baby was born, she suckled in addition to her own the baby of a neighbour who had died at confinement. The patient developed a sore on the breast about a month after, and was obliged to give up the foster child, which shortly afterwards died of marasmus, a very common end for syphilitic babies.

There are strong grounds for belief that the patient acquired *syphilis insontium* in thus doing a charitable act. Even if this is not the true explanation of the infection, the fact remains that there were three children syphilitic and unsuspected, in other words suffering from occult syphilis. Another male recently received as a patient was suffering from general paralysis of the insane and his blood yielded a positive reaction. The blood of his wife and two children was examined and in all a positive result was obtained. It is eighteen years since this patient became infected and if he had not developed mental symptoms it would never have been known that the wife and children were syphilitic. The question which concerns us all is how much of this occult syphilis is in the community and what relation does it bear to the incidence of mental abnormality of every kind. An individual may contract the disease and have the initial sore and secondary manifestations so lightly that he or she is ignorant of the fact that the disease has been contracted. It is a well recognized clinical fact that those patients who have few or no skin lesions, are very prone to have deep seated and brain syphilis. Many general paralytic patients deny ever having contracted syphilis although frankly acknowledge having put themselves in the way of becoming infected.

Sir Frederick Mott considers that if the brain of the developing human embryo is affected by syphilis, it dies before it comes to maturity and abortion or miscarriage results. The syphilis show an abnormal incidence of abortion and still-births. So do the heredity charts of the idiot patients at the Kew Cottages. A child born with syphilitic lesions on the skin usually dies in a few days, but a child who does not show any signs of syphilis until about a month or six weeks after birth, can be treated with some measure of success. If treatment is not faithfully carried out, a not infrequent state of affairs owing to ignorance or indifference on the part of the parents, the child struggles along, suffering from the disease all its life which is usually a very short one; a diseased body with a defective mental equipment. Congenital syphilis thus interferes with the development of the nervous system which is not complete at birth and the growth of intelligence is affected even to the extent of producing the lowest form of idiocy. As many factors influence the extent to which the brain is impaired in congenital syphilis,

the degree of mental deficiency which ensues varies in different patients. A child may be idiot almost from birth or as a juvenile general parietic he might be quite a smart lad at school till about puberty, after which mental deterioration may be fulgurating in character. The majority of the cases of dementia coming on early in life are syphilitic. In Melbourne twenty-one out of twenty-three insane patients who died under the age of thirty years, were found to be syphilitic at the *post mortem* examination.

Syphilis will cause general paralysis of the insane as long as thirty years after the primary infection when the circumstances of the initial chancre have faded from the patient's memory and it affects the children and the children's children even unto the third and fourth generation, not necessarily by transmitting the organism to that extent, but by intellectual and consequently moral degeneration, as low-grade intellect, poverty and crime are closely associated. An example of this is seen in the heredity chart of an idiot in one of the Victorian institutions, where five out of ten brothers and sisters are shown to be in the custody of the Penal and Lunacy Departments of this State. The father and children are syphilitic, the father being the grandson of a man who occupied a high position in the British Empire by virtue of birth and intellect. In this way a man of high mental attainments and social position may have for grandchildren unskilled labourers or even worse, all of whom are a curse to any country.

Sir Frederick Mott has computed that 3% to 5% of the total number of syphilitics end with general paralysis of the insane or *locomotor ataxia*. There are no records available of the number of *locomotor ataxia* cases diagnosed yearly in Victoria, but it is recorded that there is an average of 20.3 deaths in the public hospitals yearly from that disease not taking into account the deaths in private practice. It is therefore a fair estimate to take the lower figure 3% as representing the number of general paralysis of the insane cases which are diagnosed every year. As all the general paralytics in Victoria come under the supervision of the Inspector-General of the Lunacy Department we can make use of his statistics to estimate the number of syphilitics infected in Victoria each year. The average yearly number of general paralysis of the insane receptions recorded by the Lunacy Department for the sixteen years ending 1920 is fifty-five. If fifty-five represents 3% of the total number of syphilitics in Victoria for each of those years, then 1,833 represents the total number of fresh cases of syphilis for each year or 29,333 for the whole of sixteen years. The introduction of 1,833 syphilitic persons into our national blood stock every year will easily account for the frequency with which occult syphilis is discovered in the *post mortem* room. The number of insane per thousand of population in all countries is between three and four which is somewhere about the figure for Australia, some of the States being a little lower than the others. In Victoria in 1920 it was 3.97, practically four per thousand of population. According to Mott's estimate previously mentioned, 3% or thirty per thousand of all syphilitics, become insane from general paralysis of the insane and according to Victorian statistics (figures taken for 1920) 3.97 per

thousand of population are insane. This means that the syphilitics supply about ten times more insane in proportion than the general population. This is a moderate estimate, because it does not take into account the number of insane other than general paralytics who owe their insanity to syphilis. The total percentage of the insane who owe their insanity to syphilis can only be estimated by careful blood and *post mortem* examination and every investigation in that direction shows that the figure is a high one. In *The British Medical Journal* of March 10, 1923, Sir Frederick Mott says: "Every measure whether educational, prophylactic or remediable which tends to diminish the spread of syphilis, will tend to diminish enormously the proportion of cases admitted to asylums, hospitals, institutions for the blind, the deaf, dumb and for mental deficiency due to congenital syphilis."

I am firmly convinced that our respective governments would have taken action long ago in dealing most vigorously with the venereal and the mental deficiency problem, were it not for the privately expressed opinions of some of our profession that the urgency of the situation is exaggerated. The mere fact that any medical man should doubt the need for urgent action is enough to give the politician fears that he might be committing the country to a big expense that is not justified and we cannot wholly blame him, because in the mind of the layman there is an idea that because a medical man is a medical man, he must be in a position to express an opinion on every branch of medical science. Another drawback to progressive legislation on these lines is having laymen (worthy and educated though they be) advising and approaching the government in these matters, all armed with statistics and information gathered from various sources, sufficiently diverse to imperil the success of the movement and yet not having the medical education necessary to secure the confidence of the legislator whom they are interviewing.

Let us hope that the meetings of this Section of the Congress will produce something that will be of use to any Government which is alive to the necessity of reducing the incidence of mental deficiency and venereal disease.

DR. R. ARTHUR stated that Dr. Lind's paper was of such value that it merited being given a wider circulation than it could obtain in the transactions of the Congress. The only way to obtain more efficient control of venereal diseases was to educate public opinion on the subject. It was folly to spend huge sums of money on the end results of syphilis as found in hospitals and mental hospitals when preventive methods could be carried out at a fraction of the present cost. Besides the rapid sterilization of infective individuals, it was very important that an educational campaign should be carried on among the young to inform them about and warn them against the dangers of venereal disease. The medical profession itself should be educated to realize the enormous part played by syphilis in the production of gross forms of insanity, mental deficiency and the lowest grades of imbecility and idiocy.

SIR HENRY F. MAUDSLEY said that Professor Allen had drawn attention many years before it was recognized in London to the part syphilis played in the causation of disease. Dr. Mott also had given definite statistics and Dr. Lind's paper should be recorded as based on definite facts and not on theory and the public made acquainted with them.

DR. S. V. SEWELL supported Sir Henry Maudsley in his remarks as to Professor Allen's work and its non-acceptance by students and teachers until the Wassermann reaction changed this in London and elsewhere into belief in his assertions. The Commonwealth should endeavour to prevent and cure would be thus less called for; educating the public was the only way likely to be effective in dealing with syphilis.

DR. A. W. CAMPBELL said two points in the paper struck him, the frequency of gonorrhoeal sequelæ in the insane and the frequent association of concealed syphilis and mental disorder. The key note of the situation was to diminish venereal disease.

DR. LIND in his reply said the Wassermann test was not reliable in congenital syphilis after puberty, they regarded as syphilitic changes those which were similar to appearances in the definitely syphilitic child; a general fibrosis without the cell formation of active syphilis was seen and could not be explained in any other way. He invited members to inspect slides of specimens at his laboratory.

SOME OBSERVATIONS ON FOLIN AND WA'S METHOD OF BLOOD ANALYSIS.

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THOSE of you who are interested in the ætiology of mental diseases and have read American journals during the last ten years, will be familiar with the name of Professor Otto Folin who busied himself with some biochemical problems in physiology and then applied his results to the blood and other excretions of mental patients particularly with regard to the total non-protein nitrogen, urea nitrogen, creatinin, uric acid and sugar content. At the same time Van Slyke studied the carbon dioxide capacity of the serum or alkaline reserve, as well as the amino-acid content; other workers improved methods for estimating cholesterol, ferments and inorganic substances like phosphorus, calcium.

Some of Folin's researches dealt with such substances as creatinin, uric acid and sugar, as well as urea of which there are but 1.4, 2.5, 80 and 12 milligrammes respectively in one hundred cubic centimetres of blood, amounts far too small to be readily calculated by methods then in vogue.

Remembering, however, the success attending his colorimetric methods of estimating creatinin in urine, he set himself the task of essaying similar methods suitable for the blood. Believing that our department was likely in the near future to be called upon for some of these tests, I set about finding out what I could, sending to America for such apparatus, reagents and literature as would help in the work. However, it turned out that these tests were needed in the first place in the clinical wards of the general hospitals and our first task after getting on with the experiments was to introduce these methods to the pathological laboratories of these hospitals, lending apparatus when necessary. Since that time the most cordial relations have existed between all these centres and each of us has felt it a duty to inform the others of any new methods or tips we have picked up. This is a most

desirable state of things in a country where many of the new reagents have scarcely been heard of.

Meanwhile we were called on to examine the serums of certain mental patients and after discussing conditions in them and in ordinary diseases, I think it would be profitable to add some paragraphs on some of the difficulties we have encountered in our work and how they have been met.

To date we have records of tests applied to the blood of about a dozen normal folk chiefly for blood urea, total non-protein nitrogen, creatinin, uric acid and sugar and a few of the carbon dioxide combining power. We also made a few observations on the cerebro-spinal fluid after modifying the processes that we used for the blood.

Normal Findings.

We found that the amount of thirty milligrammes of non-protein nitrogen given by Folin as normal, is usually exceeded a little, thirty-five to forty being more common figures, while his urea nitrogen of fifteen milligrammes agrees generally with ours. If we should get amounts from twenty-five upwards we should certainly consider kidney function as affected. His figure 2.5 milligrammes for uric acid too does very well for a standard but newer, simpler and more accurate methods for estimating this substance having only recently come in, we shall be in a better position to criticize normal uric acid figures when we have used them oftener. His creatinin standard of 1.5 milligrammes is very rarely exceeded and his sugar standard hovering around one hundred milligrammes per hundred cubic centimetres of blood must be interpreted as varying from about seventy to one hundred and forty milligrammes, according to the time after food the blood has been taken.

Hospital Patients.

We have records of about forty-six examinations from about forty general hospital patients, chiefly for sugar in diabetes, urea in kidney or prostatic cases, creatinin in suspected kidney disease, and uric acid as an early sign of interstitial nephritis or gout.

If the non-protein nitrogen is increased, it almost certainly means that the blood urea is increased too, so that if the urease is working all right, this test may well be omitted. In late kidney disease where function is seriously in abeyance, we have found the urea nitrogen figures as high as one hundred and fifty milligrammes. Estimations of three times this figure have been reported to us. Figures reading twenty-five to fifty certainly suggest kidney disease and in urinary surgery one commonly advises special treatment of the patient before starting a major operation. Admittedly many old patients turning up at the consulting rooms of such specialists show a urea nitrogen figure in the neighbourhood of forty milligrammes, but the constancy with which we get normal people's readings between twelve and eighteen would lead us to presume such patients as those showing over twenty-five are not in good health.

Unfortunately we have examined very few patients with gout. These have shown higher uric acid values and this test is valuable for differentiating between gout and any other arthritic disease, such as rheumatism or gonorrhoeal inflammation. Uric acid seems to be one of the first blood ingredients to be held up in early kidney disease;

in many of our patients this retention is, therefore, a very valuable sign of early interstitial trouble.

Creatinin, on the other hand, is easily excreted and only later in the disease do the kidneys find difficulties in concentrating this substance. Nearly everyone has his creatinin value about 1.5 milligrammes per hundred cubic centimetres. As the amount estimated in five cubic centimetres of blood filtrate or 0.5 cubic centimetre of blood is only about 0.008 milligramme the delicacy of the colorimetric methods is very manifest. Myers and his collaborators found in about eighty-five persons that a creatinin value exceeding five milligrammes meant death within a few years, often a few months.

In only two or three patients was this rule found to be at fault. He explains that in a few instances the kidneys may be acutely inflamed or an acute state be superimposed on a less serious chronic state and that in this condition recovery is quite possible. We had such a case; a patient having acute stoppage from an enlarged prostate, developed uræmia and showed a creatinin value of over six. He did quite well, but every other patient brought under our notice died within a few days. The value in one patient of mine was over fifteen milligrammes and in two of Dr. Wardlaw it was fifteen and twenty-five milligrammes respectively; all died on the night of the examination.

It may be convenient here to note that the standards now used are nearly always the same substance as the unknown, for example uric acid is compared with uric acid. However, sometimes a coloured glass will act; such a one is the "Newcomer" brown-tinted glass for acid hæmatin for hæmoglobin value of blood and potassium bichromate for creatinin in urine.

The importance of testing for uric acid and creatinin is that special feeding and treatment may reduce the urea but unless the creatinin comes down too, the patient is in a bad way and a high uric acid value may be associated with a medium urea content, the latter finding being sometimes misleading.

The Blood Ingredients in Mental Diseases.

Unless the mental disease was associated with some definite physical disease, it must be admitted that the findings have not been very illuminating. The sugar test is chiefly of value in revealing the glucose intolerance or the reverse in patients with certain endocrine anomalies, especially after the injection of adrenalin. Dr. Bostock showed before a meeting of the New South Wales Branch of the British Medical Association some patients with psychoses associated with arterio-sclerosis. These were quite young subjects and their blood findings were quite normal. However, in arterio-sclerosis in old patients or *tabes dorsalis* or general paralysis of the insane associated with this condition the non-protein and urea nitrogen, uric acid and creatinin at once commence to show higher values. In a few cases of the toxæmia of pregnancy higher nitrogen values obtain, but many patients show no variations.

It would seem to us that the regular food and life of the ordinary mental patients tend to prevent accumulation of these particular ingredients. We shall have to extend our researches over a much larger number and variety before much of importance can be presented. We

have not yet met a patient manifesting an important lessening of the combining power of the blood for carbon dioxide.

Drs. Prior and Jones, living in mental hospitals, often see patients seriously ill. These observers often find excess of some ingredient in the blood or cerebro-spinal fluid, urea for instance or calcium. But we in laboratories away from hospitals have not such chances.

Choice of Apparatus and Reagents.

Folin states that the smaller Dubose colorimeter acts quite well enough for his purposes. I have both one of the larger size and also the smaller and recently a modification of the latter with a heavier metal foot and longer plungers has been devised by Pellin, of Paris. It is certainly an excellent instrument. Myers in his "Practical Chemical Analysis of Blood" alludes to a sort of Sahli colorimeter in which one looks sideways through two carefully chosen test tubes. Again Messrs. Hawksley, of London, sell a colorimeter made by using two carefully chosen test tubes; on looking down them, the light being reflected up either by a simple mirror or white porcelain, fluid may be removed or added to one side by simply using a bent pipette and test.

After many trials Folin retained 10% sodium tungstate and sulphuric acid for protein precipitation. All sorts of minor points come into consideration and I shall allude to them in turn.

Ten cubic centimetres of blood are taken and mixed well with seventy cubic centimetres of water. It is the simplest procedure not to use any citrate or oxalate, but if the latter must be used, sodium oxalate tends to interfere less with the uric acid test later than potassium oxalate. To this blood and water in a Florentine flask is added slowly with shaking ten cubic centimetres of 10% sodium tungstate and then ten cubic centimetres of two-third normal sulphuric acid, the latter specially slowly. Precipitation of the proteins now takes place, but is not completed unless one places the vessel in the oven at 37° C. for fifteen minutes, when a chocolate brown colour shows that the process is complete. If one hurries matters by heating over a flame, the filtrate instead of being water white often has a reddish tinge and may give an unduly high non-protein nitrogen result.

The mixture is simply filtered through filter paper and a drop of toluol will help to preserve it in an ice chest till required. If kept long, uric acid and especially sugar disappear. Good suitable sodium tungstate should be so free from sodium carbonate, its chief impurity, that ten cubic centimetres of a 10% solution only needs about 0.5 cubic centimetre of tenth normal hydrochloric acid to neutralize it to phenolphthalein. Poorer specimens may be used if one finds out how much extra sulphuric acid will just precipitate the proteins, but too much acid will precipitate some uric acid.

The Filtrate Should be Neutral to Congo Red Paper.

The last lot of tungstate I got, while looking excellent and answering tests, tended to froth while the non-protein nitrogen test was being carried out and when it was used for preparing the uric acid reagent I found that the control was a decided blue. This quite unfits it for that purpose.

The blood filtrate is now ready for a number of examinations.

Non-Protein Nitrogen Estimations.

Folin's Method.

Thick pyrex American glass marked at thirty-five and fifty cubic centimetres must be used. All other brands of glass crack under the stress of both the heat and the phosphoric acid used. Micro-burners instead of ordinary Bunsen burners are to be preferred and can be made by any mechanic if provided with a pattern. Asbestos plates with holes 1.5 centimetres in diameter conveniently conserve the heat to the bottom of the test tube.

Into such a pyrex tube (two hundred millimetres by twenty millimetres) five cubic centimetres of blood filtrate, one cubic centimetre of sulphuric-phosphoric acid mixture and a good glass bead are added. The flame is kept low for half a minute and then turned full on till dense white fumes appear, and the syrupy acid mixture "creeps" like glycerine up the sides of the tube and looks colourless and clear. The flame is turned low again, care being taken not to let the process go so far that the hot mixture becomes opaque. The fluid is cooled for ninety seconds and at first a drop or so then more water is added, the tube being rotated till water up to the thirty-five mark has been added. The diluted mixture should be clear; if not, either time should be allowed to effect a deposition of the precipitate and the supernatant fluid should be removed or by a modification of a fifty cubic centimetre pipette a filtration through cotton wool stuffed into a piece of glass tubing should be effected.

The standard consists of one cubic centimetre of a solution of ammonium chloride or sulphate (one cubic centimetre is equivalent to 0.3 milligrammes of nitrogen) two cubic centimetres of phosphoric acid mixture, diluted up to seventy cubic centimetres with distilled water (tap water often produces a precipitation with Nessler's solution). To the blood filtrate fifteen cubic centimetres of Folin's special new Nessler's solution are added and to the standard thirty cubic centimetres. In a few minutes the solutions are compared in a colorimeter.

Set the standard at 20; then 30 multiplied by 20 and divided by the reading gives the number of milligrammes of non-protein nitrogen in one hundred cubic centimetres of blood.

The mixing is most important. The nitrogen-containing mixture is to be thrown into the Nessler solution and then the mixing is quickly effected. Otherwise a cloud may readily be formed. In any case if the nitrogen be in too great excess a precipitate will appear and the mixture will be useless for colorimetric estimation. That is why I prefer to gauge the probable amount of nitrogen present in the blood by doing a preliminary urea nitrogen estimation.

Wardlaw's Modification.

The phosphoric acid mixture referred to above is so difficult to manage so that no precipitate forms (probably attacks the glass or bead) that I have tried Dr. Wardlaw's modification. He uses one cubic centimetre of plain sulphuric acid and a crystal of copper sulphate the size of a pin's head and proceeds as above.

In any case in a recent article it has been suggested

that a drop or so of saturated potassium persulphate solution be added after the heating and that the acid mixture be again brought to boiling; this acts wonderfully in clearing up the total nitrogen estimations. With whole blood I recommend up to one cubic centimetre of persulphate solution and with milk up to two cubic centimetres and then boiling up again to clear the mixture. In this method of Wardlaw as more acid is used, the mixture is diluted only to twenty-five cubic centimetres and twenty-five cubic centimetres of Nessler's solution are added instead of fifteen cubic centimetres. The average figures fall a few milligrammes below those of the phosphoric acid method, but the chances of failure through other causes are practically nil. The standard here needs two cubic centimetres of sulphuric acid and fifty cubic centimetres of Nessler's solution. For total nitrogen work (and indeed any boiling in glass vessels) all glass ware should be physically dry. This condition is obtained either by leaving strong alcohol and not water in glass ware or drying thoroughly in a hot air oven. By these means water is driven out of the interstices of the glass and air substituted, thus preventing particles of steam bumping your material ceilingwards. Folin's acid mixture:

Phosphoric acid syrup (85% H_3PO_4) 300 c.cm.

Sulphuric acid (H_2SO_4) 100 c.cm.

Copper sulphate (6% CuSO_4) 40 c.cm.

Water 400 c.cm.

The mixture is set aside until a white precipitate of calcium phosphate is deposited; the upper clear liquid is decanted for use and Folin's new Nessler solution consists of one hundred and fifty grammes of potassium iodide, one hundred and ten grammes of iodine, and one hundred cubic centimetres of water.

It is placed in a five hundred cubic centimetre Florence flask, together with an excess of mercury (140 to 150 grammes). The flask is shaken vigorously for fifteen minutes until the iodine has nearly disappeared. When the red iodine is visibly pale although still red, the mixture is cooled in running water and shaken till the red iodine becomes the greenish blue of the double iodide. The fluid is poured off from the excess of mercury and is diluted to two litres. The final Nessler solution is thus made:

To three and a half litres of 10% sodium hydrate 750 cubic centimetres of the above iodide solution are added and 750 cubic centimetres of water. This is mixed and left to deposit; the clear supernatant fluid is then poured off for use.

However, I find that the biniodide of Hg. supplied by the State Drug Depot answers quite well.

Urea Nitrogen.

Folin's Method.

Five cubic centimetres of blood filtrate are placed in test tubes that have not previously had Nessler's solution in them (this inactivates urease). A few drops of pyrophosphate mixture are added and then one cubic centimetre of urease mixture. The mixture is left in the oven at 53° C. for fifteen minutes or longer at 37° C.. Next the ureased filtrate is placed into a 200 × 20 test tube (preferably "Pyrex"). The first tube is washed out with not more than five cubic centimetres of water; then two cubic centimetres of saturated sodium borate solution are

added to the ureased filtrate and the mixture is boiled so that the ammonia is driven off into a similar sized test tube containing two cubic centimetres of a twentieth normal hydrochloric acid solution and as much water. I generally boil till not only I hear the acid sing or hum, but till the steam driven over boils the acid. Frothing may trouble especially if the urease be old, but if you are going to Nesslerize the acid containing ammonia mixture you cannot add either amyl alcohol, kerosene, turpentine or, I suppose, even caprylic alcohol as all these cause a cloud with Nessler's solution. These can only be added if one is going to use titration methods.

The acid mixture is then diluted to 22.5 cubic centimetres, the standard containing 0.3 milligramme of nitrogen in one cubic centimetre diluted to ninety cubic centimetres being also ready. The fluid to be tested is added to 2.5 cubic centimetres of Nessler's solution and the standard ninety cubic centimetres to ten cubic centimetres of Nessler's solution and they are now examined in the colorimeter.

Setting the standard at 20, the number of milligrammes of urea nitrogen in one hundred cubic centimetres of blood is obtained by multiplying 15 by 20 and dividing by the reading of the unknown.

The urease is thus prepared. We grow the "Jack bean" every year for it appears that the ferment deteriorates after twelve months. Planted in good loamy rim soil it takes nearly ten months to mature and the longer it is left on the plant to ripen and dry, the less ammonia is likely to be present in the bean itself. When the bean is quite ripe, it is ground in a coffee mill till as fine as flour and kept in tins in cool, dark and dry places. Five grammes are taken and one hundred cubic centimetres of 30% alcohol and placed in a glass stoppered bottle in which has been placed about two grammes of "Permutit" (which has already been washed with 1% acetic acid and washed well). This synthetic aluminium silicate has the same affinity for ammonia as spongy platinum has for hydrogen.

All are shaken up together for fifteen minutes and allowed to settle in the ice chest twenty-four hours and the supernatant fluid filtered or it can be filtered at once (some specimens lend themselves to filtering much better than others). This alcoholic extract keeps well in the dark on the ice for six to eight weeks or even a month in a cool dark place and if kept in separate small bottles. Its activity may be tested on solutions of urea.

The "Permutit" is used to remove any ammonia present in the Jack bean. One should always test this reagent. American meal is remarkably free from ammonia and so was some that we grew some years ago but this year's crop contains some which we can readily remove by "Permutit." This "Permutit" sand can be washed free from dirt and kept in alcohol. When enough has been saved the ammonia can be driven off with alkali and the sand treated with acid and dried, when it is as good as new.

The pyrophosphate mixture is thus prepared:

Sodium pyrophosphate 140 grammes.

Glacial phosphoric acid 20 cubic centimetres.

Water to one litre.

Sometimes this mixture crystallizes and a little phos-

phoric acid syrup instead of the glacial acid overcomes this difficulty. Quite good pyrophosphate may be made by allowing crystallized sodium phosphate to effervesce in a warm atmosphere and then heating to redness in a porcelain crucible over a Bunsen burner till a little of it dissolved in water gives a white instead of a yellow precipitate with silver nitrate.

Shorter Modification of the Urea Test.

As a lot of time is consumed boiling off the ammonia into acid and frothing may spoil everything, I most earnestly commend the following modification for three important considerations:

(1) It can readily be determined in a few moments whether there is much excess of urea.

(2) When this is known it can be arranged how much filtrate will be required for the non-protein nitrogen estimation. Turbidity can thus be avoided when it comes to adding Nessler's solution. This applies to the boiling method for urea as well, a part of the ureased filtrate only being taken.

(3) Quite a saving of time is effected and as is the case with pure sulphuric acid in the non-protein nitrogen estimation, many parallel tests have shown that the sulphates only limit the development of the colour in the Nessler's solution to the extent of giving one, two or three milligrammes below the amount obtained after all the trouble of boiling into acid.

Two test tubes are taken and urease, pyrophosphate and five cubic centimetres of blood filtrate placed in each. They are then heated 54° or so for about ten minutes. One tube is then made up to the twenty-five cubic centimetre mark with distilled water and one cubic centimetre of the standard containing 0.3 milligramme of nitrogen is made up in this case to one hundred cubic centimetres. To the unknown is added 2.5 cubic centimetres and to the standard ten cubic centimetres respectively of Nessler's solution and the result examined without unnecessary delay. One readily learns to estimate if there is twice or three times as much urea as normally present by the shade of colour and can proceed with one half or one-third of the remaining tube of urease, blood filtrate *et cetera*.

It appears more convenient to use the "Permutit" on the filtered alcoholic urease. Again it has been suggested that if thirty grammes of "Jack bean" powder be treated with twenty cubic centimetres of 15% alcohol and ten grammes of "Permutit" and shaken and filtered, strips of filter paper soaked in the filtrate, dried and kept dry, keep active for a year. One half of a square inch does for one estimation.

Uric Acid.

The earlier methods of estimating this ingredient involving as it did several centrifugalizations, were most time-consuming, but worse than that their validity has recently been called into question owing to the alteration the silver salts underwent. A new method has been devised by Benedict which not only is much simpler, but evolves more colour from five cubic centimetres of blood filtrate than the old did from twenty cubic centimetres. We are thus enabled to perform this test on any case coming before us.

Test.

In a test tube five cubic centimetres of blood filtrate are placed and into another five cubic centimetres of diluted uric acid; to each add four cubic centimetres of sodium cyanide solution and then one cubic centimetre of uric acid reagent is added; both are mixed quickly and placed in pot of water just off the boil, from which the Bunsen burner has been removed. The first steps must not exceed four minutes; the heating three minutes and after quickly cooling in cold water the readings must be completed within five minutes or else a white precipitate may separate out.

The number of milligrammes of uric acid per hundred cubic centimetres of blood is determined by placing the standard in the colorimeter at 20, multiplying 4 by 20 and dividing by the reading of the unknown.

The fine blue colour developed is derived from the following reagents:

Sodium Cyanide Reagent.

Sodium cyanide 5% solution with about two cubic centimetres of strong ammonia to the litre. This reagent kept in brown bottles lasts about two months.

New Uric Acid Reagent.

Sodium tungstate 100 grammes.

Water 600 cubic centimetres.

Arsenic pentoxide 50 grammes.

85% phosphoric acid 25 cubic centimetres.

Concentrated hydrochloric acid 20 cubic centimetres.

Boil for twenty minutes, cool and dilute to a litre. It keeps well.

One brand of sodium tungstate, otherwise an excellent sample, proved quite unsuitable for this reagent as a colour developed when it was boiled as a control.

New permanent uric acid standard:

Uric acid one gramme.

0.3% lithium carbonate 150 cubic centimetres.

Heat to 60° C. to dissolve; dilute to 500 cubic centimetres after cooling, then add "Formalin" (40% formaldehyde) 25 cubic centimetres.

Acetic acid three cubic centimetres, shaking to remove the carbon dioxide, and dilute to one litre, keeping in separate brown bottles in a cool, dark place. For use dilute one in ten for urine and one in two hundred and fifty for blood.

The diluted uric acid standard for blood tests thus prepared.

Take one cubic centimetre of the strong solution; to it add 125 cubic centimetres of water, ten cubic centimetres of two-third normal sulphuric acid, one cubic centimetre of "Formalin" and make up to 250 cubic centimetres. It keeps for three weeks.

Creatinin.

Amounts of this substance less than 1.5 to 2 milligrammes in one hundred cubic centimetres of blood, that is about the normal, give very little colour with the reagents, but with larger amounts a tawny shade commences to develop that is much more readily matched and read.

Test.

Place ten cubic centimetres of blood filtrate in a test tube and five cubic centimetres of standard creatinin solu-

tion with fifteen cubic centimetres of water in another test tube and to the first add five cubic centimetres of alkaline pierate solution and to the second ten cubic centimetres. Mix and leave for ten minutes and then match in the colorimeter using the porcelain instead of the mirror for reflected light.

Placing the standard at 20, then the number of milligrammes in one hundred cubic centimetres of blood is obtained by multiplying 1.5 by 20 and dividing by the reading of the unknown.

The alkaline pierate solution is five cubic centimetres of 10% caustic soda added to twenty-five cubic centimetres of saturated pieric acid in water. It must be used soon. As the pieric acid is the most important element here and develops chromatic troubles if left long in solutions exposed to light, only small amounts should be dissolved at a time. Good specimens on addition of alkali should not darken more than 100%, very good specimens not more than 50% in fifteen minutes as compared with the pieric solution without the alkali, in a colorimeter, that is as twenty is to fourteen. A method of preparing good pieric acid is to add 700 cubic centimetres of distilled water to fifty grammes of pieric acid, boil till clear and while boiling add ten cubic centimetres of strong hydrochloric acid; cool, wash by decantation with one hundred cubic centimetres of water; repeat the recrystallization, transfer to a Buchner funnel and wash with about one hundred and fifty cubic centimetres of water; dry in a desiccator between filter papers.

Another method is to crystallize from benzene; this produces the purest product, but the original reference had better be consulted.

Creatinin standard.—Having prepared creatinin according to Benedict's excellent article, one transfers to a litre flask six milligrammes, then ten cubic centimetres of normal hydrochloric acid, dilute to a litre, transfer to bottle and add four to five drops of toluene (toluol).

As the colours must match closely here to obtain accurate figures, if the creatinin be in excess, ten, fifteen or even twenty cubic centimetres of the standard creatinin solution may be used. In the latter case, of course, only alkaline pierate is added. Above this the difficulty is overcome by taking less blood filtrate.

Blood Sugar.

As the phenol reagent of Folin and Dennis is still used as a test for epinephrin, its formula will be included, but the new reagent recently introduced for sugar does not react to the same extent with phenol groups found in diabetic bloods and besides a blue colour is developed much more readily.

Test.

Not being provided with Folin's waist tubes, long test tubes about two centimetres, are taken; into one is put two cubic centimetres of blood filtrate; into the other two cubic centimetres of a 0.01% glucose solution and then into each two cubic centimetres of alkaline solution of copper sulphate. Place the tubes in vigorously boiling water for six minutes, cool in water and then add two cubic centimetres of the special new reagent, mixing till no more bubbles come off. Leave for a few minutes, dilute to twenty-five cubic centimetres and read in the colorimeter.

Calculation—

Placing the standard at 20, then 100 multiplied by 20 and divided by the reading of the unknown gives the number of milligrammes of glucose in one hundred cubic centimetres of blood.

Special Method With Small Quantities of Blood.

To 0.2 cubic centimetres of blood add 1.2 cubic centimetres of water in a centrifuge tube, add 0.3 cubic centimetre of 10% sodium tungstate solution, mix, then add 0.3 cubic centimetre of two-thirds normal sulphuric acid and mix; warm in the incubator till chocolate coloured; centrifugalize till one can readily pipette off one cubic centimetre blood filtrate, add to this one cubic centimetre of alkaline solution of copper sulphate, heat for six minutes, cool, add one cubic centimetre of the reagent and dilute to 12.5 cubic centimetres and compare as above. In this case use for boiling the filtrate test tubes half the diameters of the first tubes. The results compare favourably with the volumetric method of Hagedorn and Jensen.

New sugar reagent.—Molybdenum trioxide 35 grammes (or ammonium molybdate 47.5 grammes). Sodium tungstate 5 grammes. 10% sodium hydrate solution 200 cubic centimetres. Water 200 cubic centimetres.

Boil long enough to drive off the ammonia, cool, dilute to 350 cubic centimetres and add 85% phosphoric acid 125 cubic centimetres and dilute to 500 cubic centimetres.

Alkaline solution of copper sulphate.—Take forty grammes of anhydrous sodium carbonate, in 400 cubic centimetres of water in a litre flask and on solution add 7.5 grammes of tartaric acid; when dissolved add 4.5 gramme of copper sulphate, mix and make up to a litre; decant any sediment.

Old phenol reagent.—Transfer to a large flask twenty-five grammes of molybdenum trioxide or thirty-four grammes of ammonium molybdate, one hundred and fifty cubic centimetres of water, one hundred and forty cubic centimetres of 10% sodium hydrate solution; boil for twenty minutes to drive off the ammonia. Then add one hundred grammes of sodium tungstate and fifty cubic centimetres of 85% phosphoric acid and one hundred cubic centimetres of hydrochloric acid. Boil gently over a reflux condenser for four hours and later add water to eight hundred cubic centimetres. Dilute after cooling to one litre.

Sugar standard.—The strong standard is 1% solution of glucose in a saturated solution of benzoic acid. The weak standard for use is one cubic centimetre of the strong standard in one hundred cubic centimetres of saturated solution of benzoic acid.

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SEX AND ITS INFLUENCE IN THE CAUSATION
OF MENTAL PSYCHOSES.By J. V. McAREE, M.B., B.S.,
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PERHAPS of all the advances of medical science none has caused more controversy and divergences of opinion amongst the medical profession than the statement that the abnormalities of the sex impulse, whether congenital or acquired, are the foundations of all or nearly all of the psychoses with which civilized man is afflicted. The storm of opposition to this statement is rather of a sentimental than a scientific nature, so there was no compromise between the Freudians who saw sexual defects everywhere, and the older school of neurologists who were content to dogmatize on preconceived ideas rather than to test the reliability of these statements by their own unbiassed experiments. My experience is that many of the psychoses have a sexual origin and, if the Freudians hold that all are so, when only many are, then their error is merely one of degree, which is more pardonable than the older school which denies without proof the possibility of such occurrences. To anyone who has studied the unconscious mind which is the home of prejudices, *id est* organized beliefs, one can understand, however, how this opposition exists. Amongst the Caucasian people sex passion has been held as degrading and disgusting, whilst its mention, let alone its scientific examination, was left severely alone. At one time there was as much opposition to the dissection of the human body and hence the gross ignorance prevailing of its various organs and functions: more so of medicine and surgery. In a less degree when germs were found to be the cause of disease, there was an antagonism because preconceived ideas had imagined something more imposing that could not be reconciled with the thought of our august bodies being the prey of such lowly creatures. So, when it was stated that the sex impulse had such a powerful influence in the causation of mental derangement, the idea was not merely foreign to those who had not studied the subject, but it was also distinctly objectionable. Amongst the pagan nations there were no such views held: in fact it was the reverse and symbols of sex were used in phallic worship because they considered that that which had to do with the creation of a new being was a god-like attribute. Even to-day many of these symbols persist unrecognized in such things as the Young Men's Christian Association triangle which originated from the pubic hair, and the various parts of church architecture which had their origin as symbols of the male sexual organs.

When ancient Rome began to decay these views degenerated, so that licence and debauchery held sway. With the advent of Christianity there came a great reaction and not only was continence preached, but anything pertaining to sex was tabooed, because it was taught that it was sinful and dirty in itself. Example: the biblical narrative of the woman who was forgiven by Christ after being taken in adultery was not quoted in any sermons, so great was the feeling of the iniquity of sins against sex. The Romans used baths which were the scenes of

many gross vices, so the Christians taught that a dirty body, being unattractive, favoured purity of soul. The "odour of sanctity" is supposed to have originated from such a cause and one monastery of one hundred and fifty inmates made a boast of having only one towel between them. Now all this has a bearing on the present day, as I hope to show later. Many people, not content with continence, teach that sex is in itself degrading and dirty, quite overlooking the fact that the mind of God which designed it all must also be impugned, if such views are held about His works. I am dwelling upon this, because I will quote cases later to show that ignorance on such matters has led to an immense amount of marital unhappiness and in some cases to mental psychoses. Let me here state, however, for fear of being misunderstood that speaking medically—apart from morally—I do not consider that continence does harm to the normal person provided the proper safeguards are observed. Furthermore, it is the only sure way to avoid venereal disease. However, suitable conditions are not always present nor will many people submit to this idealistic state. Mankind may be divided into three classes: Firstly, those who are either unmoral or immoral and whose lapses cause them little worry. As a rule venereal disease is all they have to fear. Secondly, those who are not only continent, but are able to be so without undue strain; these are the best off. Thirdly, those in whom the sexual impulse is so strong or the inhibiting part of the brain so weak that the struggle between the two becomes detrimental. It is from this class that the bulk of cases of psychoses are drawn. It may now be opportune to mention a few facts about sex, so that we may be in a position to appreciate the tremendous power it wields for good or for evil.

In the simpler forms of life we have no sex. Thus a microbe breaks into halves, each half forming a fresh individual, which soon grows to the size of the original germ. There is no death from old age, so unless by accident the microbe is destroyed, the cells live for ever. In other organisms of a higher nature the male and the female organs may co-exist or alternate in the same animal. As, however, we ascend the ladder of life, we find that portion of two separate animals by their union give rise to the seed or ovum out of which develops the new individual. The object of this is that the great law of Nature, namely variety, may be favoured. The direct chain of life is through the cells of the ovaries and testicles and not through the cells of the body. The rest of the body forms a shell, the most important biological function of which is to see that the chain of life is preserved. This, of course, necessitates the survival of the body for a sufficient time. The instinct or impulse which governs this, is called the self-preservative instinct and it is the first and most dominating influence. Anything which conflicts seriously with an instinct, may, if it be sufficiently powerful, cause mental trouble. Thus, the war furnished numerous examples of the self-preservative instinct being outraged by discipline and courage. Instincts belong primarily to the subconscious mind; hence we can understand how in shell-shock the subconscious mind will often paralyse an arm or render a person blind, because by this means the soldier is removed from an intolerable situation. If it were conscious, he would be

simply a malingerer and we know this is not so. In a similar manner the sex impulse may cause damage either by the effort made where the control is imperfect or because it has been directed into wrong channels. The reason why we see more of sex psychoses than self-preservative ones is because in ordinary civil life the sex impulse is more likely to be subjected to stress. It is not, however, the only one, as I have had many cases in which sex did not enter into the causation of the psychoses. As is well known, the male is differentiated from the female, not only by anatomical differences, but by mental characteristics. In the embryo the first few months the sexual organs are duplicated, so one cannot determine the sex. Then one set develops, whilst the other atrophies, so that the sex is determined. At birth the organs are incompletely developed and remain so till puberty. During the period of childhood the sex impulse is having a powerful effect on the development of the child. I may here say that when I speak of sex impulse or instinct, I mean it to include much more than a mere union of sexes, of which there may be no conscious knowledge. Thus the whole relationship between the sexes as indicated by love of clothes, dancing and the like. The sex life may be divided into the infantile period, which is entirely auto-erotic (that is to say, a love object is not necessary, as a child is self-centred as regards the sex impulse). Here the impulse is diffused widely over the infant's body, while certain zones are specially connected with it, so that stimulation of these causes pleasure. These are chiefly the anus, lips, penis and clitoris. The relationship is shown in many ways. Thus the pleasure of holding motions in the rectum, so often indulged in by children and mistaken for constipation, has been increased by manual manipulation and has resulted in some of the more marked cases of the children growing up to be sodomists. Thumb sucking (lip pleasure) also persists sometimes into adult life, has continued in a woman till marriage, during which time it ceased, to be started again on the woman becoming a widow. Masturbation is not uncommon in babies of twelve months old. This period is also called the pre-inhibitory period, *id est* the child has not been taught shame, so will expose its body with pleasure. (One can compare this with exhibitionism seen in adult life, which is a reversion to this, often to the exclusion of coitus). After four years till puberty we get an inhibitory period during which shame is taught. Sex impulse is more or less latent, though far from being entirely so. The child may love inanimate objects, such as a doll or a shawl, but that this is merely symbolized love and not a diversion of the sex impulse is shown by the fact that a real baby will cause a doll to be forgotten. In adult life we get a reversion called fetishism, where an inanimate object is loved with sex pleasure to the exclusion of living persons.

The peculiar male and female characteristics are largely developed by internal secretion from the testicles and ovaries, as is shown that by castration there is an approach to the characters of the opposite sex. As puberty arrives there is a sudden development of the sexual organs, so the child becomes a man or a woman. There is now a definite desire for a living love object, with or

without conscious knowledge; the giggling of young girls in the presence of the male sex is largely a subconscious expression of the sex impulse. There are a number of secondary instincts whose purpose it is to supplement the primary instinct in the attainment of its purpose. Thus, there is a tendency in the normal male to delight in the exercise of force and even to be somewhat cruel. This tendency is called sadism, being a descendant of a stronger instinct of the cave man who often used a club to persuade his choice to submit. In some cases the instinct may be abnormally increased or perverted, so that the man is excessively cruel, causing the so-called love bites to be replaced by more serious injuries, as exemplified in the Colin Ross murder case in Melbourne. Or the sexual impulse may be directed in these channels entirely, instead of being merely helped by them. The result may be that a man gets sexual satisfaction from acts of cruelty, having emission during them. Thus in the case of a certain Marquis in France over eight hundred children were murdered in ten years from this cause. On the other hand the normal female enjoys a certain amount of domination provided it is not excessive. As one lady said that she would like to be seized and carried away, provided it were by the right man. This is called masochism and is a descendant of an instinct of other days.

Now we meet cases where it is abnormally developed, so that the person gets a sexual satisfaction only when the pain is being inflicted on them. The sex impulse is therefore a force which may be deflected from the ordinary paths and be transferred to other fields of activity. This transference of impulses is a most important factor in explaining many neuroses. It occurs under several conditions, as for example, where a child is subjected to stimulation of some of the erotic zones; the sexual impulse travels continually by this path and so may remain there permanently. This explains the origin of that prevalent vice, sexual inversion. I will now quote the case of a patient who was sent to me by Dr. Chisholm Ross, of Sydney.

Mr. B., aged forty, was addicted to sodomy which had lasted for twenty-seven years. Though he was married, he did not get nearly so much pleasure from coitus as from his vice. He also masturbated and drank alcohol to excess to make him sleep. He could never go to sleep before he had consumed several bottles of beer, after which he would get a short troubled rest. He was an exceptionally clever man, holding high University degrees. He suffered greatly from remorse, but was powerless to conquer his vice or alter his feelings. When fighting against his temptation he sometimes would lie on the ground, foaming at the mouth and struggling against it. He tried to make up for it by being very charitable. His trouble dated right back to childhood, when his teacher had taught him the vices both of masturbation and sodomy. He became a clergyman and taught in a boys' school. Like many sodomists he had a great liking for boys apart from coitus, just as normally the opposite sex have an attraction for each other. He was found out, dismissed and disgraced. Later on he married, being for some time happy, but his vice did not leave him, so coitus, masturbation and sodomy were practised. Finally he took to drink. I got his history by psycho-analysis, gave him a good explanation of the sex impulse and finally treated him by hypnotic sug-

gestion. After the first sitting all desire for alcohol left him. He slept for nine hours the first night, though previously he used to sleep but three or four—with the aid of six bottles of beer. Gradually I transferred the impulse into normal channels. Once or twice he masturbated, but did not commit sodomy. Finally the masturbation was given up, with the result that he became normal in fourteen days. I heard a couple of years afterwards, both from his wife and from himself, that he was perfectly well, which made them both very happy.

Sodomy is very prevalent in Australia, but because of the fact that it is punishable by law, has such a stigma attached to it and because it is not so urgent as venereal disease, it goes on without its frequency being suspected. To a skilled observer the peculiar walk of a passive sodomist, as well as the way he dresses *et cetera* are sure methods of diagnosing his inversion. Just as one may have all stages of physical inversion from a hybrid to a man who has merely a tenor voice, so in the mental order of things people are born whose psychic structure varies from complete sexual inversion to a mere single characteristic of the opposite sex. Women can also be inverse as well as men, as is illustrated by a Sydney case quoted some time ago in THE MEDICAL JOURNAL OF AUSTRALIA. The following case is one of interest and is fairly typical of a large class.

Mrs. G., aged thirty-four, was sent to me by Dr. Plummer, of Adelaide. The patient had an obsession that people could read her thoughts, thus seeing that they were impure. The fact that she was far from sexual in her thoughts made no difference to her obsession. It became worse and worse, until at the end of four years, when she was sent to me, she was so affected that she could not sit down in the tram without wanting to shriek out, because of the people opposite to her. She could neither entertain nor go anywhere. She did not know why she had it nor did medical treatment do her any good. I treated her, as is my custom, both by psycho-analysis and suggestion at the same time, because so far from there being to my mind any antagonism between these two forms of treatment, I find I get the best results from a combination. I often use material learned from dreams in modifying my suggestions, while sometimes I analyse under hypnosis. It would be impossible to go into the details of the analysis, but briefly state that an eye was a dominating feature in several dreams. By analysis I learned that when she was six years old she was given a lecture about masturbation by an elder sister. She was told how unnatural and how degrading it was. She always stood in awe of this sister, being in special terror of her eye which seemed to pierce her through and through. In due time she married, being happy until she found a stain of semen on her husband's night clothes when he had not had connexion with her. She concluded that he had masturbated and was very unhappy. In the meantime war was declared and the husband enlisted, being away for four years. During this time her pent up sexual impulse had no outlet, so she became nervy and finally the impulse, being uncontrolled, took the following painful obsession: "If I were pure and good, he would want to have connexion with me, therefore I must be no better than he. My thoughts must be impure—impure thoughts are shown by facial expression, therefore people can read my thoughts whenever they look at me." When the husband returned, the obsession remained in spite of coitus; she used to stay awake and notice that his body went

through an orgasm with emission. This worried her more than ever. She was treated by suggestion, and had sex thoroughly explained to her, especially the fact that seminal emission occurs normally during sleep and that this was what happened with the husband instead of masturbation. She made a complete recovery in about five weeks and her husband told me a year later that she was still all right. Moreover, she had changed from a peevish woman to one of angelic disposition. In this case she had an abnormal detestation for masturbation, the impression being made during the suggestible period of childhood by an unscientific description and this formed the stage on which her dammed-up sexual impulse set the play.

This is frequently noticed about neuroses, that is the root of the trouble extends to childhood. The more we study the subconscious mind, the more we understand the reason for many otherwise inexplicable symptoms. The best way to go about it is by psycho-analysis, hypnosis and by comparison with animals. This matter is so important in the study of all psychoses that it may not be amiss to give a few of the more important points about the subject.

Psychologically speaking, we divide the brain into three portions: the conscious, the pre-conscious and the subconscious. The former includes our reason, memory and will-power. The pre-conscious contains those memories and experiences which can be recalled only with difficulty, whilst the sub-conscious consists of many things. First it contains the memories and experiences that cannot be called up by voluntary effort. Actions and thoughts tend, after being practised long in the conscious, to be cast down to the sub-conscious, where they are organized so as to become automatic. Thus in the case of a person learning to play the piano each note has to be learned with effort, but later the piece is played automatically, so that little or no effort is required. If it were not so, we could never store up anything, but we would have painfully to plod at everything we did. So we see that this automatism approaches the way and instinct acts, as illustrated in many cases of animals where intricate series of actions are often performed automatically. In the case of thoughts it is the same. A child has certain views drilled into it at its most suggestible age and these are accepted to be organized without reason coming much into play. Thus we have the fact that a man is usually of the religion into which he is born; the same applies to politics and many other things. About each we have learnt certain things either from teaching or by experience. These groups of associated ideas are called complexes which, though mostly forgotten by the conscious memory, stay in the sub-conscious, out of sight, like the submerged parts of an iceberg, forming the greater part of our mental life and strongly influencing our views and actions. Example: Ask an Englishman and a German what they think of Zeppelin raids. The former describes them as barbaric, the latter as quite the proper thing. Each will advance more or less plausible reasons which, whether correct or otherwise, are not the actuating reasons for the beliefs which in each case, is due to national complexes associated with love of country. So in religion and politics each opposing debater thinks his argument irrefutably logical, so that the other must be dishonest in his contentions. An onlooker may see bias

blinding both of them. It is because the preconceived view comes from the unconscious that it is so hard for the person to recognize it as such. They will see the bias in another person quickly enough, but not in their own case. Take the example of a football crowd: the umpire gives a penalty, half the onlookers may shout "Cheat!" the others "Quite fair." Now were the spectators conscious of their mistake there would be no interest attached to it, but one has only to glance at their faces to see that they are in earnest, really believing what they cry out. We are now beginning to get an insight into the etiology of imperative ideas and of the delusions of the insane which are sub-conscious in origin and as such not amenable to reason or logic. Just as people differ in religion or politics, will advance reasons or views which are often illogical but which seem good explanations to them, so will people who are insane or suffering from psychosis, advance reasons in good faith which, however plausible, are not the real ones which actuate them.

In hypnosis, especially in the deeper forms, we gain more or less complete control of the subconscious, which usually takes its orders from the conscious, just as a general passes his orders through his subordinates to the soldiers. Take a case I quoted in another paper when I hypnotised a young man, telling him that his arm must become paralysed. This happens because the sub-conscious obeys the hypnotist, whilst the conscious is in a dormant state. In the same way I can render myself invisible, or render the patient deaf, dumb and so on. Examples of this are seen in the war, where after being temporarily blinded or deafened by a shell explosion the soldier continued to remain so after the physical injuries were healed, so that there was no organic cause for the deficiency. The probable explanation is that hearing and seeing are active processes, so to establish function the dendrites of the spider cells must be put in contact with others coming from the afferent nerves. In functional deafness or blindness these are retracted or separated, because the sub-conscious believes there is no use in extending them. Suggestion will here act and on these being extended function is restored. The same applies to paralysis and it is for this reason that cures of pain, sight, deafness, paralysis and the like are so popular in various religious healing missions and why we never hear of a patient growing a new leg or being restored to life after his head has been cut off. In the same way the patient may be made see a rose and smell it, though it is non-existent. So in dreams and the vivid visual delusions of insanity, the brain sees things without the aid of the eye, which, of course, normally never sees anything, but merely conveys vibrations to the brain which is the part that sees—as a result of these vibrations. Hypnosis is not a pathological state any more than a motion produced by a laxative is pathological. It is an increase of the normal suggestibility of the brain; the sleep and other states are merely suggested phenomena and are not necessary for the deepest conditions. We are all more or less suggestible; thus if I say to a man suddenly, "close your eyes," the order is usually obeyed without any interference by the conscious. This is different from blinking the eyes by a sudden movement in front of them, which is merely reflex. By suitable suggestions superimposed one on the

other, this normal plasticity of the brain is increased, so the hypnotic state is produced. It is facilitated by fixation of the attention, accompanied by tiring of the conscious brain from gazing at some bright object. In the case I was referring to I gave a post-hypnotic suggestion that at 10 o'clock next day he was to go into the kitchen and give a knife, fork and spoon to the cook. As 10 o'clock approached I noticed he became restless, but could give no reason. He went in and looked at the clock more than once, without knowing why he wished to know the time and so was there on the stroke of ten. As the clock struck, he put his hand to his head and obeyed the order. When the cook asked him why he did so, he said: "The spoons are not properly cleaned." The cook indignantly replied that she felt sure he was asleep. The points of interest here are the compulsion of the act, the evidence of subconscious mentation (as shown by his going to see the time without knowing why) and the more or less plausible reason given for his action. Here we can compare how obsessions compel people to act against their knowledge, so we see how apparently meaningless actions have underlying causes, that the explanations of a melancholic as to why he is sad or a person with an obsession, are often plausible, but are not the real ones. There is another close analogy in dreams where a person is awakened by some outside stimulus, with the result that the dream is rapidly formed to be in accordance with this stimulus. Thus, a man may dream he is going for a long walk and after several incidences, comes to a village blacksmith's. He hears him beating the anvil and awakes to find somebody knocking on his door. Dreams are sub-conscious thoughts represented as symbols, just the same as a cartoon. The dream materials are usually taken from the previous day's experience or else from long ago. The sub-conscious mind expresses itself by symbolization and in doing this it is a reversion to a simpler type of thinking called atavistic thought. We see examples of it in primitive peoples, as the Egyptians, where symbolic pictures was their method of writing on papyrus and rock. The Asiatic races love parables instead of direct description, so that dreaming is a reversion to a type of expression that may have been common in primitive man, when the sub-conscious or animal brain had more sway and the intellectual was less developed.

One function that dreams have, is that they act as safety-valves for the pent-up impulses, especially the sexual one, because these are the most likely to be dammed back in the waking life. The sexual wish is often symbolized by the dreams and so discharged, affording relief. Thus we find that sleep which rests the physical body, also rests the psychical. Sometimes, however, there is no disguise and then the dream is often accompanied by a seminal emission. This is especially noticeable after a man has given up masturbation and often for want of knowledge or by reading quack literature, he sees in these nocturnal emissions a weakness which does not exist. This may so prey on his mind as to be the cause of a neurosis. Thus one young man who came to me, having symptoms of melancholia, had amongst his dreams the following: He was in a railway train looking out the window, when he saw a number of girls in nightdresses dancing on the green: they held a large net in their hands, whilst by his

side in the train was a young lady. By psycho-analysis—the train journey signified his honeymoon with the girl he wished to marry. The girls on the lawn signified his sexual thoughts, which he had when addicted to masturbation. The net signified a scrotal support, meaning that he considered he was sexually weak as a result of masturbation, so that he could not marry. Hence his melancholia. On explaining to him that there was no weakness present, that over 90% of mankind had masturbated at some time or other and that 99% had seminal emissions, he got much better, being completely cured by a course of suggestion. I need hardly say that in reporting these cases I merely touch on the bare outlines, not describing their technique, because there would be enough material in one case for a paper. Thus when psycho-analysing, one often has to dig a lot of useless ground before getting the gold. Moreover, in most cases as in this a number of dreams are analysed which led by different symbols to the same obsession. There is no fear likely to lead to depression quicker than anything suggesting impotency or sexual weakness.

His brother, aged twenty-seven, who was a lawyer, also came to me with somewhat similar symptoms. Though he also had a complex about his self-preservative instinct, as well as a sex complex. The former was as follows. He dreamt that he was standing on a wharf with a camera and having two lenses was about to substitute one for the other. As he was in the act a number of white balls struck his hand, causing one of the lenses to drop over into the water. He was about to take off his coat to jump over, but noticing that the lens floated he was in no hurry, in spite of the urging of a man who stood by. On asking him the meaning of the dream, he said he felt sure there was none, as the whole thing was senseless. He said he was an amateur photographer, so probably the dream was merely a silly jumble of thoughts about the day's actions. The analysis, however, revealed the following associations: "Lens" stood for position, "wharf" for safety, "balls" for interested advice, "sea" future, "man" for lawyer. Finally I learned that he was in a position in Adelaide, but had been offered a second position in the country which he was thinking of taking. The man over him wished to go to England and tried to dissuade him from giving up his position (ball striking his hand) because he would be hard to replace. Therefore all he said was to run down the country partnership. The dreamer was going to plunge after it, however, but was not in a hurry because the position was left open for some time (the lens floated). He had a severe mental conflict whether he would stay in the safe, sure position (wharf) or plunge into the unknown future (sea). He at once recognized how he had been unconsciously worrying over the conflict, made his decision, whereupon the symptoms disappeared. He had, as I have said, sex trouble, but I have no space to deal with it except to say this was also cured in a short time. It is very important in treating all sex cases to have them take up interests apart from work in order to absorb their energies.

Thus one boy whom I was treating for masturbation by suggestion improved greatly, but was not cured till seeing he was of an artistic temperament leading a lonely life I got him to take up music, when all temptation left him,

so that he was cured. I remember one case of a very heavy smoker who on stopping his smoking became a regular Don Juan until he went back to it again. Of course smoking ordinarily has no significance, but his sex impulse evidently found relief in this way, as it may do in numerous ways according to the individual. I have seen a single woman in whom the sex impulse was so strong that she had previous to my seeing her submitted to mutilation, the removal of the vulvæ to try to relieve her. This of course would have no effect, since the trouble was in the brain. This class of case is called nymphomania.

Frigidity is a condition that is very prevalent amongst married women, giving rise often to much marital unhappiness, and sometimes leading to psychoses. In any case a function which is intended for a marital bond and love, fails in its purpose. The causes are many. Perhaps the most frequent is hyper-modesty. Modesty may be defined as the opposition of the female to the advances of the male and in the scientific sense exists in animals as well as in human beings. Normally it affords woman her greatest protection and charm, but there is nevertheless a big difference between it and morality, so they are by no means always proportionate to each other. Thus, take three classes of people in whom, contrary to expectations modesty and morality do not go hand in hand. The savages go naked and yet they are in many tribes strictly moral. The Caucasians are moderately moral and moderately modest, as is indicated by their dress, speech *et cetera*. In South America there are a people so modest that they drape the legs of the chairs and tables, but are very loose-living themselves. I have known of an old maid who used to drape her furniture in the above manner. In many tribes of Arabs and Maoris when a man wishes to marry a girl, he asks consent of the father. On getting it he carries the girl away by force. The girl may be just as anxious to get married as he, but custom demands that she must struggle with all her power and if she does not leave scars on his body from her teeth and nails, it is reckoned a great reproach to her modesty. Here we see examples of a sadistic and a masochistic nature.

The Caucasians do not instruct girls in sex matters and many have only vague notions of the sexual functions even after puberty. Thus, while a boy will have definite sexual ideas, a girl often has but vague day-dreams of the Cinderella type. Now this is all right in most cases, but many get so shocked on experiencing marriage, perhaps because they have had it drilled into them that all sex is so degrading or perhaps the husband may be at fault in unduly hurting his wife. At any rate, ever afterwards the woman experiences either no pleasure or even intense anguish. It is very prevalent, though not much discussed, leading to a lot of unnecessary misery. If people were taught that the sexual act in marriage was the most wonderful thing, being for the creation of a new being, that the pleasure accompanying it was lawful and should be for a bond of union for the home, it would be more logical than the reverse. Perhaps 30% of all married women are frigid. I remember one case which had some uncommon features, though the principles are essentially the same. A woman, whose husband I cured of shell-shock, told me she became frigid after the birth of her first baby, where previously she had pleasure. Now she had intense an-

guish and passed the day in fear and trembling. There was no anatomical reason to account for it nor could she give any explanation. By psycho-analysis: Her father was a libertine, who treated both her and her mother shockingly; in fact he planned to get his daughter dishonoured. In this he was unsuccessful. As a result the girl had a great hatred of men until she found the man whom she learned to love and whom she married. She was happy till the first baby was born. While she was in a weak and suggestible state, half under chloroform, the thought came to her mind: "Mother must have suffered like this when I was born. Poor mother, how hateful is child-bearing, when the whole question of sexuality has made her suffer so much. I hate anything that is sexual." This thought completely disappeared from her conscious, but became lodged in her sub-conscious. As so often happens in melancholia and other psychoses which often start after a weakening cause like influenza or over-work, has made the brain suggestible and so gives some depressing suggestion a chance to take root. She did not remember this till it was brought up by analysis. It was this complex which gave her anguish whenever her husband approached her. A girl has usually to mask her feelings in accordance with the dictates of modesty and this combined with erroneous instructions causes many women to become so distorted in their views that when they are married, their sex sense is so atrophied that they may even pride themselves on being devoid of all feeling with reference to their husbands. They think sex passion in a male as a pardonable fault and a degrading one in a female. As a matter of fact it is they themselves, who are at variance with the plan of Nature and theirs is the more degrading view. I remember one case where a good looking single young woman, aged thirty, had told me she had never had the wish to marry. Here her association for the word "marriage" was "disgusting." The analysis ultimately led to an incident when she was six years old. She had a sexual offence committed against her by a man. This incident was forgotten, but it remained in her sub-conscious mind twisting and distorting her views of man and marriage. Compare how an article of food, which has made a child sick, may cause a dislike in adult life for the same food even after the original incident as been forgotten.

Miss A., aged thirty-two, had a friend with whom she was in love, thinking the feeling was reciprocated. The man went to the war and she corresponded with him regularly. On his return she took him to her home where he met and became engaged to her sister. The shock to her was so great that she broke down with melancholia and insomnia. After two years' misery she was sent to me by Dr. Mayo, of Adelaide. She had been taking "Veronal" and other hypnotics every night without much effect. I came to the conclusion from reasons I have no space to state, that the original breakdown had passed off and that her insomnia was largely due to auto-suggestion, that she was afraid she would go insane from want of sleep. I treated her by hypnotic suggestion, with the result that within a few weeks she was sleeping eight hours every night with complete restoration of health.

This bears out what I have said in another paper, that some melancholias may persist as functional after the original organic cause has been removed, just as in case

of functional deafness or blindness persisting after the parts have been restored to anatomical soundness:

Miss M., aged twenty-nine, suffering from melancholic depression, wishing that people would not dislike her, as she felt sure they did. Symptoms had lasted for several years. She gave me the following dreams: (1) She was standing by a fence with a girl companion; she leant over and plucked some figs from a tree; an elderly man looked at her and smiled. She walked away with the girl friend. A young man arrived and the three walked together to a church. The girl friend was in the centre. The man talked earnestly but finally left them when they came to the churchyard. The scene changed; she was driving with an unknown man in a motor car. Next, they arrived at a cottage. On entering alone she saw a woman seated, suckling her baby. The woman looked sad and weary, but when the baby smiled the woman did also. The dreamer said to herself, "This is not so disgusting after all." (2) The second dream was when going down the street she came on an open parcel of women's clothes and lingerie. A child came and said: "This belongs to mother." She refused to give them up; the woman then came and the dreamer said, "For five shillings I will give them up." A man present said, "Quite right, the woman will have to go to the lost property office for them." The scene changed, she was in Balaklava in her sister's house. She was examining the parcels of clothes on the table when she saw the face of the woman pressed against the window looking at her; she was frightened, but her sisters came in and the face faded away.

By psycho-analysis I learned the following history. Two years ago she was engaged to a young man who often quarrelled with her and her family. He was very fond of figs which they used to eat together. She had weird notions of sex, having been told that it was debasing, so she thought that the feeding of an infant at the breast was disgusting. She always had a longing for fine things, but noticed a woman who lived near her, and who was the mother of a large family, spent her time at the wash tub. The patient had a girl companion whom she admired for her decision of character. Before she was engaged she led a more or less care-free life and used to attend church socials and dances and the like. An elderly man was a verger of the church she used to attend, where she had such happy times. The engagement was broken off largely through the advice of a girl friend, which decision was supported by the family, especially by the sister who lived at Balaklava.

One can now see how each dream pointed to a conflict between the sex impulse and her desire for comforts which she could not expect if she married. Thus the dream No. 1 meant she was getting something (figs.) to reconcile her with her *fiancé*, the old verger reminded her of her happy single days. The young man approached and suggested a renewal of the engagement, but the friend stood between them. The young man left, so that peace and quietness, symbolized as a church yard, came. Her associations for the motor car were the pleasures of unmarried life; the cottage stood for the poverty of married life; the woman was she of all others who typified the slaving work associated with marriage. In my explanations of sex she learned that the suckling of a baby was not a degrading thing, so in her dream the smile of the baby stood for her own yearning for children, which would compensate for a lot. In the second dream the parcel of *lingerie* was for the pretty things she was unwilling to give up for married

life (the woman was the same as in the first dream). She thought that she could not pay five shillings, so she put this obstruction in her way. She went to Balaklava because she could get the moral support, as indicated by her sisters crowding round. As in all other cases there were numerous other dreams, but I have to keep to a few. The patient on learning her conflict of which she had no knowledge, became greatly improved. Suggestion, sex instruction and paths (hobbies) for her sex impulse were provided. She lost every bit of her melancholia and became light-hearted. She said she felt as if a great weight had been lifted from her which made her feel extremely happy and young.

Miss F., aged twenty-seven, had an engagement broken off on the advice of her father, the latter having ambitions for his daughter who was a good violinist. The girl after a time became melancholic with muscular weakness and insomnia, but did not associate her troubles with the above, in fact emphatically said that such was impossible. She had been ill five or six months when I saw her. Analysis of dreams soon showed her trouble and the way she was reacting to it. Coupled with hypnotic suggestion she made a complete recovery, put on weight, in six sittings. This case was interesting to me, as she went to several doctors in Adelaide without success, and then went to Sydney. The doctor, who saw her there, advised her to go to Adelaide to see me and through him she first learned of me.

In this case I was able to sublimate the suppressed energy by suggesting under hypnosis that she should take an interest in hobbies, such as gardening and the like, with complete success, though previously mere advice on the subject had no effect.

There is another type of sexual psychosis which I have often seen. It occurs in people of sensitive consciences, who, owing to some weakening factor, such as influenza or over-work, find they are not able to resist their sexual imagination. They get frightened, which causes sex thoughts to become obsessions. Thus one teacher had after hard work following influenza become obsessed with sex thoughts, especially when saying his prayers (because he was more afraid of desecrating the sacred time of prayer). The thoughts would also refer to God; such thoughts would force themselves upon him: "If God is omnipresent, is He in a bottle or a privy?" He was ill for eighteen months, becoming worse, so he could not sleep, lost weight. Finally he came to me and with sex instructions, psychoanalysis and hypnosis was well after a dozen sittings.

Often a psychosis will start because some physical defect gives the person a belief he will never succeed in getting anyone to care for him, especially if he is both neurotic and erotic.

I must now bring my paper to a conclusion and must cut out a lot of interesting facts, but if I have trespassed on your time, it is because I feel the matter so important, so universal and yet so neglected. Some time hence it will be universally taught in the medical course, but if I can shorten that time or encourage the profession to experiment themselves, a lot of unnecessary suffering would be removed from the world. At all times man was half psychic and half physical and owing to the enactments of modern civilization, at no time has the former been more subject to stresses and so requiring intelligent and rational handling. If we do this we will be performing a greater national duty in bringing health and happiness to

many otherwise doomed to misery and by helping to build up the best foundations for our evergrowing Commonwealth, by having citizens whose minds will be as healthy as their bodies.

SIR JOHN MACPHERSON expressed appreciation of Dr. McAre'e's paper, but found difficulty in understanding the position taken up by the writer who, although he avoided any reference to the Freudian theory, yet used the phraseology and symbolism of that school throughout his paper.

The Freudian theory, as apart from the method, was losing ground in Europe and America; no doubt every credit was accorded to Freud for his great clinical work, but his most prominent adherents, notably Adler and Jung, had dissociated themselves from it, though both of them used psycho-analysis in suitable cases. Dr. McAre'e suggested that the medical profession were unwilling to face the sexual questions involved in a consideration of the Freudian doctrine. He disagreed with this statement and said the profession, he thought, were so far removed from prudery in this respect that they would gladly discuss any question provided they were convinced that the Freudian theory were true. The difficulty was to believe that the fixation of the *libido* was, as Freud maintained, the sole cause of the pathogeny of the neuroses and psychoses; every other consideration, heredity congenital predisposition, illness, physical abnormality and so on was brushed aside in favour of this one speculative conception of the fixation of the *libido*. The profession believed that sexual causes might act as excitant of any functional nervous disease, but it was by no means the one and only cause. The cause of a neurosis was in the present not in the past life of the individual and the past memories were only secondarily involved. These were the infantile phantasies which, as Jung rightly pointed out, were of no causative significance in the formation of a neurosis, for every one had them. They had no relation whatever to the fixation of the *libido*, so insisted on by Freud. If the fixation of the *libido* was the cause of a neurosis how was it that the subject of a neurosis was not always ill? Were they to suppose that at certain times it was fixed and at other times not? The only rational position to take up was that any emotional shock acting in the present, might in a predisposed subject give rise to a neurosis and that the infantile phantasies of the Freudian doctrine were secondarily aroused memories and phantasies, the more conspicuous the more abnormal the subject was.

DR. RALPH NOBLE said that many people who professed to use psycho-analysis did not really understand the Freudian doctrine and likewise many others became critics after a merely superficial study of some of the literature on the subject. The disciples of Freud had done his theories much harm because of the narrow point of view they held in their enthusiastic worship of their master. Most of them did not follow accurately the teachings and method of Freud. The term psycho-analysis was too loosely used. It should be applied to Freud's own method only. The main weakness of most analytical methods was in the interpretation of dreams. Very different interpretations of the same dream were given by analysts and they should conclude that the interpretation used was just that one which best fitted in with the analysts' own idea regarding the cause of the neurosis. Analysis was essentially a method of suggestion, although Freud denied this. Before an analysis was decided upon, a very careful investigation must be made, otherwise a border-

line condition could easily be turned into a psychosis. There was no separation between the psycho-neurosis and the psychosis group; the one merged into the other. Patients who could be given with safety a prolonged analysis must be intellectual enough to understand underlying principles and to react adequately to the re-educational process of the treatment. A psycho-neurosis was a lack of adaptation to the environment and the treatment must aim at ascertaining the underlying conflicts which were giving rise to the condition and at assisting the patient to make his own adjustment and to accept a new and more wholesome philosophy of life.

PROFESSOR J. P. LOWSON said that Freud did not say that sex was at the bottom of every case, but only that in all he had investigated it had been so, though there might be other causes. Another point was that *libido* meant genital gratification. Freud believed that most neuroses were referable to defects in infantile development, that all emotions they designated by the words love, affection between human beings were genetic derivatives of sex, that these feelings were phylogenetically connected with the sex instinct. Warps and twists communicated to young children of five or six years might have an important effect on the subsequent life and sex development. A debt was due to Freud for opening up the whole question of the connexion between adult life and infantile experiences. He had been more astonished at Freud's correctness than his incorrectness. In regard to the locale of the states of sub-conscious, pre-conscious and conscious they claimed that they knew as much and as little as any physiologist.

DR. R. C. WITHINGTON said that fear was at the base of all cases and on it theories of all kinds were built. Fear was due to ignorance or false ideas and sex difficulties were met with because of ignorance while young of sex life. Parents were the proper ones to teach the child and failing them the medical man. If properly instructed they could understand sex difficulties and readjust themselves, should difficulty arise in later life.

DR. McAREE said in reply that it would be impossible to discuss fully in the time given the various questions raised by the several speakers.

Firstly, Sir John Macpherson had said that he objected to sex being everything in the causation of psychoses. In his paper he distinctly stated that sex was not the only cause. Stresses on the self-preserved instinct, for example, as well as worry, fear and the like, could cause trouble, while even in admittedly sexual cases there were probably other predisposing causes present. Sex stresses were amongst the important causes but since his paper was on this subject he naturally confined himself to it. In former papers he had dealt with non-sex psychoses and their treatment. Sir John Macpherson made a strong point that because they could not anatomically localize a sub-conscious focus, therefore it did not exist. He had given a lecture on fear, but had not localized where this emotion existed in the brain. In fact, most of the psychic manifestations of the brain had not yet been mapped out. They could not localize ordinary consciousness, but did not doubt its existence for this reason. The sub-conscious was deduced from its effects as seen in hypnosis, automatic actions and the effect of forgotten experiences. There were numerous observed facts about the mind which could be best explained by such a theory, but in absence of such a view were almost inexplicable. The study was in its infancy, so many modifications were most likely to be made. But after all, the question as to which was the right theoretical view was quite subordinate to the prac-

tical results of the cure. He could quote numerous cases, all substantiated by other medical men in which cures have been brought about dramatically. Often these patients had not been improved after years of ordinary treatment.

One speaker had suggested that dangers might arise from injudicious treatment or by selecting wrong cases. He quite agreed that diagnosis and discretion should be used, but because someone had made an error in the selection or in the conduct of a case, surely that should not be a condemnation of the method nor did it nullify the numerous persons who had been cured.

Another speaker said that because he had heard that a knowledge of the German language was necessary for full comprehension, he had ceased to take interest in psycho-analysis. That might be patriotic, even super-patriotic, but it was hardly scientific. However, if he wished to learn that it was still possible to be an Englishman and to believe in psycho-analysis, he should study "The Mind and its Disorders," by W. R. B. Stoddart, and the works of several other eminent English writers. It was neither English nor German writers, who had influenced him as much as his patients he had seen benefited; as long as these patients were cured he would continue along these lines.

CONCERNING GENERAL PARALYSIS OF THE INSANE.

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COMMENCING with an apology for the sketchy character of this communication, I offer this subject for discussion: "Is general paralysis of the insane increasing or decreasing?"

Those of us who have been for thirty years or more specializing in lunacy, will probably agree that the type has changed; the old classical general paralytic, exalted and maniacal, is more uncommon nowadays; the melancholic, then rarely seen, occurs more frequently now, but as a rule dementia is the prevailing condition in by far the greater proportion of our cases, even in the earliest stages of the disease.

For many years the causation of the general paralysis of the insane engaged the attention of the neuro-pathologists, but it was only in the last decade of the nineteenth century that it was generally conceded that without syphilis there could be no general paralysis, but inasmuch as only from 3% to 4% of syphilitics develop general paralysis of the insane, it certainly appears that some other contributory factor exists determining the attack in the direction of the cerebral cortex.

Many considerations will occur to us, as for example, the tendency of a neuropathic inheritance directing the disease to the central nervous system. Doubtless many unstable individuals are of dissolute habits and more liable to run the risk of syphilitic infection, but statistical inquiries show a low return of cases giving a family history of insanity and only cases of infantile or early adolescent general paralysis can be truly said to be inherited.

Alcoholism in syphilitics I regard as a frequent factor in exciting an attack of general paralysis and I can recall many cases in which an alcoholic psychosis was diagnosed in the first instance, only to find subsequently the

clinical symptoms of general paralysis of the insane developing when those due to the alcoholic poison had subsided.

Mental stress, business worries, anxieties and failure are frequently the exciting factors in the case of men who have suffered an infection ten or twenty years previously. No doubt that is the reason why the majority of our cases appear in the fourth decade of life. In such a connexion one cannot conceive any factor more potent than war strain with its constant fatigue, anxiety, fear and horrors and if we look into the past history and writings on the subject we shall not fail to be impressed by the association of Mars and Venus in the production of this disorder.

It is just one hundred years ago since papers and cases were published in France by Bayle, a young pupil of Esquirol, describing very exactly pathological conditions found in the brain in general paralysis. Previously, however, Haslam who was on the staff of the Bethlem Hospital, had also written describing cases which we now recognize as being general paralysis of the insane and Cox in 1808 described paralysis as being associated with insanity. Cases arising at that time were the aftermath of the Napoleonic wars; and if we have regard to the statistics of this disease as set forth in the Blue Books of the English Commissioners, we should find that there was a steady climb in the numbers of general paralytics recorded after the frequent wars of the Victorian era. Coming more closely to our own times, we shall find that there was a very considerable increase in the number of cases following the South African War and it was after this that the great increase occurred in the asylums of Great Britain and Ireland. One is therefore justified in speculating as to whether the recent world war will not bring in its train a further increase in the number of general paralytics. I am convinced that this would prove to be the case, unless other influences and considerations intervene. I particularly refer to the possible effect pro-

duced by the more modern methods of treatment since the introduction of salvarsan.

When I took over the charge of the State hospitals in Victoria in 1905, I found that during that year there were sixteen patients with general paralysis of the insane admitted and sixteen deaths. In the next year there were twenty-four admissions and twenty-four deaths. The daily average number of patients resident in the State hospitals at that time was 4,500. Then began a steady climb in the numbers, as Table I. will show. The maximum number of admissions was reached in 1913, when there were eighty-eight admissions and fifty-nine deaths; in 1914 there were eighty-three admissions and again fifty-nine deaths. Then there were 5,000 patients resident daily on the average in the State hospitals. From that time on, the numbers of general paralytics began to dwindle, until in 1921 there were thirty-eight admissions and forty-one deaths. In 1922 there were forty admissions and forty-three deaths; at this time the daily average number resident was 5,250.

As this table shows fifteen years ago we began to make a routine use of the Wassermann test and it is possible that this accounted for the increased numbers recorded as general paralysis of the insane on admission, but this would not materially affect the statistical return of deaths due to general paralysis of the insane, all of which were verified by *post mortem* examinations. Our Victorian statistics, in my opinion, very definitely indicate a decline from 1914 onwards, that is to say, from a point of time, some two years or more since the treatment of syphilis by "Salvarsan" was commenced. I venture the suggestion that this is one possible reason why we are experiencing this decrease in the number of general paralysis of the insane admissions.

I have been unable to get complete statistical returns from all the States, but I submit Tables II. and III. which show the number of admissions and deaths of patients with general paralysis of the insane in the State

TABLE I.
GENERAL PARALYSIS OF THE INSANE, STATE HOSPITALS.

Year	ADMISSIONS General paralysis of the Insane			DEATHS General paralysis of the Insane			ADMISSIONS All Forms of Insanity	Daily Average Number Resident
	Males	Females	Total	Males	Females	Total	Both Sexes	Both Sexes
1905	—	—	16	15	1	16	738	4,455
1906	—	—	24	22	2	24	773	4,523
1907	—	—	42	19	3	22	728	4,571
1908	48	5	53	43	3	46	739	4,645
1909	42	2	44	50	4	54	765	4,653
1910	57	11	68	48	4	52	802	4,716 (Wassermann reactions)
1911	67	2	69	49	8	57	817	4,816
1912	65	11	76	47	9	56	806	4,938
1913	75	13	88	53	6	59	858	4,983 (Treatment by "606," etc.)
1914	66	17	83	50	9	59	807	5,046
1915	60	8	68	68	8	76	824	5,131
1916	55	2	57	57	12	69	772	5,148
1917	51	5	56	53	9	62	762	5,145
1918	36	8	44	40	10	50	762	5,189
1919	41	5	46	44	9	53	745	5,187
1920	47	7	54	43	7	53	864	5,210
1921	38	—	38	37	4	41	801	5,259
1922	37	3	40	39	4	43	838	5,347

TABLE II. showing the Total Number of Admissions diagnosed as General Paralysis of the Insane to the Hospitals for the Insane in the States mentioned hereunder and the percentage of such admissions on the Registered Insane in those States during the years 1905 to 1922 inclusive.

Year	NUMBER OF PATIENTS ADMITTED TO MENTAL HOSPITALS WITH GENERAL PARALYSIS OF THE INSANE						Percentage of Admissions Diagnosed as General Paralysis of the Insane on the Number of Registered Insane
	Victoria	Queensland	New South Wales	South Australia	Total	Total Registered Insane in these States	
1905	16	6	54	6	82	12,882	0.63
1906	24	8	56	8	96	13,321	0.72
1907	42	8	49	5	104	13,566	0.76
1908	53	6	47	7	113	13,922	0.81
1909	44	14	43	14	115	14,277	0.80
1910	68	5	53	7	133	14,704	0.90
1911	69	5	70	5	149	15,058	0.98
1912	76	10	81	7	174	15,344	1.13
1913	88	15	83	5	193	15,722	1.22
1914	83	14	95	6	198	16,163	1.22
1915	68	4	83	4	159	16,408	0.96
1916	57	6	69	11	143	16,708	0.85
1917	56	9	67	7	139	16,939	0.82
1918	44	9	72	10	135	17,272	0.78
1919	46	6	78	10	140	17,280	0.81
1920	54	6	33 (half year)	9	102	17,658	0.57
1921	38	10	74	9	131	17,755	0.73
1922	40	10	74	9	133	17,919	0.74

N.B.—Statistics for Western Australia and Tasmania not available or comparable.

TABLE III. showing the Total Number of Deaths caused by General Paralysis of the Insane in the Hospitals for the Insane in the States mentioned hereunder and the percentage of such deaths on the Registered Insane in those States, during the years 1905 to 1922 inclusive.

Year	NUMBER OF DEATHS FROM GENERAL PARALYSIS OF THE INSANE						Percentage of Deaths from General Paralysis of Insane on the Registered Insane
	Victoria	Queensland	New South Wales	South Australia	Total	Total Registered Insane in these States	
1905	16	3	69	6	94	12,882	0.72
1906	24	8	58	10	100	13,321	0.75
1907	22	10	66	13	111	13,566	0.81
1908	46	5	57	9	117	13,922	0.84
1909	54	9	45	11	119	14,277	0.83
1910	52	5	41	11	109	14,704	0.74
1911	57	13	64	9	143	15,058	0.94
1912	56	7	56	7	126	15,344	0.82
1913	59	14	64	8	145	15,722	0.92
1914	59	20	66	9	154	16,163	0.95
1915	76	13	73	7	169	16,408	1.02
1916	69	5	70	16	160	16,708	0.95
1917	62	10	62	8	142	16,939	0.83
1918	50	14	72	12	148	17,272	0.85
1919	53	7	86	5	151	17,280	0.87
1920	50	6	36 (half year)	12	104	17,658	0.58
1921	41	17	59	7	124	17,755	0.69
1922	43	10	61	7	121	17,919	0.67

N.B.—Statistics from Western Australia and Tasmania not available or comparable.

hospitals of Victoria, Queensland, New South Wales and South Australia. The latter three States do not show the same striking changes as are shown in Victoria, but they do in a lesser degree confirm our findings.

Is it possible that syphilis is decreasing? Let us compare with our general paralysis admissions the returns that the Victorian Public Health Commission publish of the number of cases of syphilis annually reported.

TABLE IV.
COMPARISON OF NUMBER OF SYPHILITICS NOTIFIED AND OF
GENERAL PARALYTICS ADMITTED TO HOSPITALS
(VICTORIA).

Year	Syphilis	General Paralysis of the Insane
1918-1919	1,924	44
1919-1920	2,311	46
1920-1921	1,507	54
1921-1922	1,635	38
1922-1923	1,380	40

The first column contains abnormally high numbers in the first two years owing, no doubt, to the return of soldiers from the front, but neglecting this discrepancy, I think we should be justified in taking 1,500 as the annual number of syphilitic infections and forty-five as the annual admissions of general paralysis of the insane. If these figures prove constant, it would mean that 3% of syphilitics develop general paralysis of the insane, but the return is far too meagre and inconclusive on which to come to any definite decision. Still, it bears out estimates formed in other parts of the world as to the percentage of syphilitics who become general paralytics.

Nevertheless, we should be justified in anticipating in a few years' time a very considerable increase in the number of general paralysis admissions to our State hospitals from those of our returned soldiers who have been infected abroad and this I feel sure will occur unless the influence which I have previously referred to, comes to our rescue. I mean the more successful treatment of syphilis by modern methods which I believe were already showing their effect as exemplified by our Victorian returns.

That thorough treatment by "Salvarsan" can prevent the development of the characteristic manifestations of syphilis is well shown in the experience derived from the Victorian venereal diseases clinic, where Dr. W. E. Johnson has treated with "606," twenty-one young women during their pregnancies, and they have borne children free from symptoms of syphilis as evidenced by the fact that blood tests taken of these children for as long a period in most cases as four years show negative results. This is but one instance of many which could be quoted to show how the treatment of syphilis has advanced and permits us to look forward hopefully, although the treatment of general paralysis itself by "Salvarsan" has in my experience proved to be an unquestionable failure. Assuming a prophetic rôle, I venture the optimistic belief that in a few decades, general paralysis of the insane may become a comparatively rare disorder.

SIR JOHN MACPHERSON said that between 1888-1889 in of general paralysis of the insane while very few cases Morningside, Edinburgh, there was an enormous number were drawn from the banks of the Clyde. In Glasgow asylums there were few cases, though the syphilis was not less than in Edinburgh ten years before; but later on in Glasgow asylums 50% of the deaths were due to general paralysis of the insane. Explanation was difficult, unless it was to be assumed that there were modified forms of the spirochæte.

DR. RALPH NOBLE said that in Western Australia when

less drink was taken, the number of cases of general paralysis did not decrease. Treatment of the disease by injection into the *cisterna magna* and other late methods as in Holland have proved unsatisfactory and abandoned.

DR. W. A. T. LIND said that in Korea syphilis was rife but there is no general paralysis of the insane unless in towns in contact with civilization. The onset of the disease followed cases of head injury and this might explain the increase noted to follow wars.

DR. S. V. SEWELL said that the treatment of cerebro-spinal syphilis by "Salvarsan" intrathecally was unsatisfactory. He had tried hypotonic saline solution injections and used 1.25% solution; it produced transient headache and pressure symptoms. This had given better results in meningeal syphilis, though as the neurones were already damaged, little real improvement could be expected.

DR. ERNEST JONES in reply said that treatment was useless, it fixed the patient in a state of dementia. He had never seen a recovery from the disease. Unless syphilis was thoroughly treated, they would get another flood of general paralysis of the insane.

THE EVOLUTION AND FUNCTIONS OF THE LABYRINTH.

By ALFRED W. CAMPBELL, M.D. (Sydney),
Sydney.

THE evolution and functions of the labyrinth, the subject upon which I have been invited to offer some remarks, is as you all know a very large one and since the time at my disposal is short, it is compulsory that my remarks shall be general in character.

In the evolutionary scheme of things the labyrinth or its equivalent is a structure of great antiquity and phyletic constancy. The function of the primary structure analogous to the labyrinth is to meet the effects of gravity and inertia. The story may well begin with the statocyst of certain invertebrate animals. This statocyst is a simple bag with nervous connexions which, when the body is displaced, gathers the effects of external excitations and secondarily induces appropriate changes of posture. So it is that molluscs respond to vibrations which have been transmitted to water. Ascending the scale, not far, only to that humble creature the lamprey, we find the beginnings of semicircular canals. Coming to more vigorous free-swimming fishes we discover in association with semicircular canals those well-known structures called otoliths which have great functional importance in underwater animals but lose their value in terrestrial animals. Rising to mammalia we find that the primitive statocyst and the otolith become converted into the maculae of the utricle and saccule. And corresponding with the increased activity of the animal there is such an elaboration of the labyrinth and its connexions that we finally get an organ of amazing delicacy and complexity, but still dealing, as in humble animals, with the same concern, namely to overcome the effects of gravity and inertia.

In brief that is the story of the evolution of the labyrinth.

Function of the Labyrinth.

It is an interesting fact of physiology, as shown by Sherrington, that the labyrinth effects reflex movements in a way exactly analogous to that in which other receptors excite movements. Hence labyrinthine action

may be regarded as part and a highly important part of the vast reflex chain of the nervous system.

The slightest movement of the head, however brought about, in any of the three planes of space, is immediately appreciated by the three semicircular canals. Such movement, through the inertia of the labyrinthine fluid, stimulates the receptors in the utricle and saccule *et est*, the maculae; that stimulation, caught up by the vestibular nerves, is conveyed mainly to Deiter's nuclei and from Deiter's nuclei in cooperation with the cerebellum, impulses projected to the brain and spinal cord automatically induce appropriate motor response.

In brief that is the labyrinthine reflex arc.

In effect by the labyrinth reflexes are excited which adjust the body to the horizontal plane. By the labyrinth muscles which move the eyeball, are in large measure controlled. And by the labyrinth tone and posture are maintained in the muscles of the neck and trunk specially and in the extensor and abductor limb muscles of the homonymous side.

This leads me to say that in controlling tone and posture, in equilibration in other words, the labyrinth does not stand alone. There are other factors, namely sight, hearing and touch.

In all balancing of the body we require to know how far we are advancing or retiring or bending. This knowledge is derived from our sense of sight. The blind person with vision restored imagines that every point in space he sees is on a plane within reach of his limbs.

The sense of hearing gives us awareness of points in surrounding planes and it is an interesting reflection that the human labyrinthine attitude is similar to that of the dog when poising its head to determine the direction of its master's call.

The sense of touch is of the highest importance. Correct posture automatically involves sensations from the soles of the feet, the pressure sense in the joints and the sense of tension in muscles. Freeze the soles of a man's feet, stand him up and close his eyes and Rombergism is manifested.

The picture now presented is a complex one and consisting of a series of reflex arcs. Sight, hearing, touch and the labyrinth with their manifold connexions are the components. Now it is a physiological law that no reflex arc exists without a controlling centre. And since from all the receptors which I have mentioned, inter-nuncial paths lead to the cerebellum, the assumption emerges that the cerebellum is the coordinating and controlling centre for all these reflex activities.

For the purposes of this communication I may next say that the connexions between the labyrinth and the cerebellum and between the labyrinth and other parts of the nervous system (the vestibulo-spinal, vestibulo-bulbar, vestibulo-cerebellar and the cerebello-rubro-cortical components which carry fibres whose functioning is recognized in the consciousness of space relations) are now fairly well-known. Hence disease or disorder which shows any perturbation of the function of equilibration, may be more or less accurately localized and appropriately treated.

It is this liaison between the vestibule or labyrinth and the nervous system which makes it fitting for the otologist and neurologist to meet on common ground. In

practice the neurologist is frequently confronted by functional perturbations, in the elucidation of which the otologist can give assistance, and I venture to say *vice versa* that there are cases in which the neurologist can assist the otologist. I am sure all neurologists present are eager to gain information derived from elaboration of those remarkable tests for determining the condition of the vestibular apparatus, tests which we associate with the name of the Viennese observer, Bárány. We desire information which will enable us surely to recognize, localize and differentiate the numerous equilibratory disturbances.

It will be interesting also to hear whether confirmation can be given of Bárány's statements concerning the existence of centres for the control of muscular tonus in the cortex of the cerebellum. Centres which he claims to have determined by temporary freezing small areas exposed in man during operation. Personally I incline to doubt the existence of such centres. And I say this with all respect to Bárány, likewise to those experimenters who have attempted to establish cerebellar localization by ablation lesion, and likewise to Bolk, who argues from his classical study that form is subordinate to function.

In assuming that the surface of the cerebellum is divisible into functional areas like the surface of the brain, these observers build on a false foundation. The apparent fact is that the cerebellum in having a uniform cortical structure, in being designed for a single purpose, in standing at the head of innumerable reflex activities streaming in from all directions, is indivisible according to individual groups of muscles or individual segments of the body; it is divisible only according to the various synergies of the muscles, some agonistic, others antagonistic, activated for purposes of equilibration, that is according to the directions of falling or of motion of the body or parts of the body.

In this connexion, as Walshe says, think of the difficulties which the clinical or experimental observer labours under when he attempts to analyse a disordered movement. He cannot see the various muscular contractions, postures and relaxations which go to make up that movement. He can only see the resultant movement, which is the algebraical sum of many synergic and antagonistic reactions all of which are completely hidden from him.

These considerations may explain why experiment on the cerebellum has given such conflicting results and why portions of the human cerebellum may be excised at operation without manifest disturbance.

In conclusion as regards both the cerebellum and the labyrinth I may quote the words of the seventeenth century philosopher Robert Boyle, of Oxford: "I consider the body of a living man not as a rude heap of limbs and liquors, but as an engine consisting of several parts so set together that there is a strange and conspiring communication between them."

VERTIGO.

By A. E. MILLS, M.B. (Sydney),
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I THINK it will be generally admitted that every symptom complained of by the patient should be carefully in-

vestigated. It is, as a rule, not difficult to collect the symptoms. It is far from easy to interpret their meaning. But if we are to have a proper conception of the condition or conditions giving rise to the symptoms complained of, it is essential that we must try to understand their meaning. Very frequently indeed our physical examination of patients gives us little information of definite value. In such cases we must rely chiefly on the statement of symptoms given by the patient. This is the only evidence before us on which to form a diagnosis. Careful analysis of these symptoms as regards their relation one to another, their relative importance, their seat of origin, their causation—indeed their every aspect, must be undertaken if we are to understand the disordered processes underlying them.

Vertigo or giddiness is a symptom, a subjective symptom. It is the complaint of the patient. We cannot tell that a patient has vertigo. We may see the effects of the disorder, the unsteady or reeling gait, the falling down. These effects are due to inability to preserve a proper balance, but giddiness may exist without these outward expressions of disorder and indeed these manifest signs may be evident without any feeling of giddiness. In walking along a narrow plank across a stream it may happen that I lose my balance and fall, but I have no giddiness. My falling is the result of a defective adjustment of my bodily musculature. On the other hand I may feel giddy and my equilibrium is disturbed. I try to adjust myself to my supposed environment and in the process I fall.

All are agreed that vertigo is related in some way to disturbances of equilibrium. In order to get a clear conception of what vertigo is and where the disturbance which causes it may arise, it is necessary to have a conception of the paths along which impulses which maintain equilibrium may pass. To preserve equilibrium impulses are constantly coming to the brain from four chief peripheral sources: (i.) the ear, (ii.) the eye, (iii.) impulses from muscles, tendons and joints and (iv.) impulses from the skin, touch and pressure. These impulses and probably others as well, for example, tactile hairs, result in muscle coordination whose most important function is to preserve equilibrium.

The tabetic with his eyes shut has instability. He then may have the sensation of vertigo, but he does not fall because he has vertigo. He falls because he experiences a sudden unexpected loss of afferent impulses from the eyes on which he has been depending to reinforce the other impulses, which, unaided, are insufficient to maintain his equilibrium. He has vertigo because the sudden closing of the eyes has intensified the mental confusion resulting from the inadequacy of the impulses from the muscle, tendon, joint and skin, which inadequacy has been compensated for by the visual impulses.

Vertigo for the present may be considered as the confusion resulting from the coming into consciousness of afferent impulses concerned with equilibrium which ordinarily are associated (integrated), but now for some reason have become dissociated. Of the impulses coming in from the peripheral organs mentioned, the most important is the ear, and any slight disturbance of the labyrinth will produce severe vertigo. On the other hand a gross lesion of the third

and fourth groups mentioned above may exist without vertigo (1).

It is from the clinical aspect that I venture to speak on the subject of vertigo, but clinical observations, if they are to be correctly interpreted, must be based upon a proper appreciation of the anatomical, physiological and pathological processes underlying them. Vertigo is a common symptom; it may exist alone, it may be associated with and directly related to many other symptoms, vomiting, nystagmus, loss of power to walk straight or to maintain the upright position. It is indeed a most distressing condition. Unfortunately it does not receive the close attention it deserves from the clinician who too often attributes it to indigestion, weak heart, biliousness *et cetera*. Vertigo is a sensation, like other sensations it is of varying grades of severity. That momentary feeling of dizziness which most of us feel on rising from a stooping position, is vertigo in its mildest grade. The same sensation is experienced by cigarette smokers after the first few whiffs of the early morning cigarette.

We experienced a more severe grade when in childhood we whirled our bodies round and round until we were unable to keep upright, and fell to the ground. The most severe form is complained of by patients who can neither stand nor sit without support, and who in consequence are forced to maintain the recumbent position and hang on to the bed, feeling that it is turning over with them, forced also to keep their eyes closed to avoid the impression that the ceiling is falling on them, forced also to maintain the head absolutely immobile, for the slightest movement increases the giddiness and its attendant objective disturbance.

A patient with vertigo may feel that he is turning round or he may feel that he is rotating and that external objects are rotating too.

Whether the sensation be slight or severe, it must like other sensations, tingling, numbness, flashes of light, tinnitus and so on, have either a peripheral or central origin. Pain, tingling, numbness may be expressions of disturbances of the peripheral nerve endings or nerve paths or of the post-central convolutions of the brain; flashes of light may indicate an affection of the retina or of the optic nerve or of the occipital lobe; tinnitus may mean that the middle or internal ear or the paths therefrom are affected or that the temporo-sphenoidal lobe is disturbed. These different nerve sensations are our conscious impressions and interpretations of irritation or stimulation of specific nerve endings or nerve paths or their central connexions or terminations.

Vertigo, likewise, expresses an abnormal disturbance of the activity or function of the peripheral endings, paths or centres of the vestibular nerve.

Now, peripheral nerve endings or nerve receptors, whether in the skin or in the eye or in the labyrinth, are those parts of the nervous mechanism which receive and transmit the stimuli received. They are in their varied forms so arranged as to receive and respond to a very slight stimulus. Their threshold for stimulation is low, when they receive greater stimuli than normal, in other words, when they are suddenly irritated, the impulses transmitted are severe and the whole specific nervous mechanism involved will be greatly disturbed.

The eye or more strictly speaking the retina may be looked upon as a delicate, nervous receptor, so arranged as to respond to the stimuli of light vibrations which are transmitted to the brain and there interpreted. Similarly we may look on the nerve endings of the vestibular nerve in the semicircular canals as delicate receptors responding to the slightest alteration of fluid pressure of the endolymph. The normal and adequate stimulus to these receptors is pressure and the effect of these pressure stimuli transmitted to the cerebellum results in the necessary adjustments for the maintenance of equilibrium. Under normal conditions neither these pressure stimuli nor their reflex effects affect consciousness.

But when the receptors receive excessive pressure stimuli or rapidly repeated normal stimuli the nerve impulses produced are correspondingly increased and not only produce unconscious reflex effects, but enter the realm of consciousness. These impulses may so disturb our sense of balance that we may make conscious attempts to remedy the disturbance or they may produce that curious sensation known as giddiness or vertigo. When, for example, the ear of a patient whose tympanic membrane has been wholly or partially destroyed, is syringed with water at blood heat, the abnormal pressure of the water on the oval window is transmitted to the vestibular receptors and intense giddiness or vertigo may result. Turning the head quickly and repeatedly from one side to another will produce successive alterations in pressure on the labyrinthine receptors, the impulses from which will produce vertigo. Let me remind you of the classical experiment of Ewald.

Ewald by means of a dentist's burr opened one bony semicircular canal of a pigeon at two spots. By the hole farthest away from the ampulla he introduced an amalgam stopping, so as to prevent any current of fluid backwards through the canal. Over the second hole he fixed, by means of plaster of Paris, a tube which was connected by a flexible rubber tube with a rubber ball. By this means, while the bird was sitting quietly on its perch, he could suddenly blow upon the exposed membranous canal without disturbing the bird in any way. By the air pressure thus produced on the canal a stream of endolymph was caused in the direction of the ampulla. Every time this was done, he found that the animal moved its head and eyes in the direction of the current and always exactly in the plane of the canal which was being stimulated (2).

Now from this experiment we may infer that there was no vertigo, otherwise there would have been loss of balance and the animal would not have been able to remain on its perch.

But certain pathological states occur in man where sudden alterations in pressure in one of the semicircular canals may be produced. The result is a severe attack of vertigo. Let me quote a case of a patient in whom there was a fistulous opening into the bony canal:

A man, aged forty-six, felt a slight itching in the right ear and rubbed it with his finger. He was astonished to notice that everything in the room rotated rapidly. Two days later while lying in bed he rolled over to the right side and found that the bed seemed to rise on the left side and to be turning over with him. He could not shake his head from

side to side without becoming giddy. He consulted a physician who elicited a history of a purulent discharge from the right ear at intervals for over forty years, though there had been no recurrence for the past four years. Examination showed necrosis of the inner wall of the middle ear with a fistula leading into the horizontal semicircular canal. After treatment this condition disappeared, and the man became entirely free from all attacks of vertigo (3).

From these facts we can understand that slight excess of pressure or repeated alteration of pressure will lead to great disturbances of sensation, recognized as giddiness or vertigo. Moreover, the labyrinthine receptors because of their delicacy are those parts of the vestibular nerve apparatus most susceptible to excessive, specific, physiological stimuli. For these reasons we may justly conclude that they are the most common sources of origin of those impulses which lead to vertigo and that a stimulus of the receptive part of the vestibular mechanism, sufficient to produce vertigo, will not have this result when applied to other parts; or to put it another way, pressure stimuli applied to other parts of the vestibular tract must be of greater intensity before vertigo is produced.

So far we have been dealing with the normal, adequate, stimuli for the production of vertigo, but we must consider the subject from other aspects. The vestibular receptors or their conducting nerve paths may by the effects of disease be rendered more irritable; vertigo may then be produced by stimuli which normally would have no result. A slight movement of the head under these conditions may produce the most violent vertigo.

Now, considerable pressure on a peripheral nerve is required before pain is experienced, but when that nerve is in a state of inflammation, say from alcohol or arsenic or beri beri or as the result of infections, very slight pressure upon it will cause intense pain.

May we not with reason look upon the vestibular nerve mechanism in the same way? Indeed, there is ample evidence for such a view. How else can we explain the violent vertigo that results from the slightest movement of the head in certain cases, a movement so slight as to produce no response under normal conditions.

But there are other pathological conditions not induced by toxic agents in which nerve receptors become excessively irritable.

When vessels supplying an area of the skin become occluded or almost occluded as a result of atheroma, so that the blood supply is very defective, that area of the skin becomes exceedingly painful and tender. The tenderness is so extreme that the slightest touch is unbearable.

Now, the stimulus of a slight touch can only affect the receptors of the skin. The intensely painful response to such a slight stimulus is an indication of the hypersensibility of the nerve receptors in the skin. Let me quote an example:

A patient while walking a short distance to catch the ferry boat, felt a sudden pain in his first and second toes. When he reached the wharf the pain had increased to such an intensity that only with the greatest difficulty could he walk back home. He was compelled to go to bed, where he remained for some weeks. He could scarcely bear his toes to be touched nor could he allow the foot to hang down because in this position the pain

became intolerable. Some days later an area on the side of the heel of the same foot became suddenly painful and tender. The pain was even more intense than in the toes. The skin of this painful area in a day or two showed signs of commencing gangrene. Eventually it sloughed away and left a very painful ulcer.

There can be no doubt that the pain and tenderness and gangrene of the skin of the heel were the result of a complete occlusion of the blood supply to it; and there can be no doubt that the pain and tenderness of the toes were due to a partial, but almost complete obliteration of the vessels supplying the skin of the toes.

When the vascular obstruction is less marked, the effects are less severe. When, for example, the muscles of the leg are imperfectly supplied with blood, there may be no discomfort in walking for a short distance, but if the patient continue walking, pain is felt in the affected leg and increases to such an extent that he is forced to rest. Soon the pain disappears, to return after the patient has walked a little further. We are all familiar with such conditions under the name of intermittent claudication.

Now, the vessels supplying the brain and cranial nerves suffer from the same pathological changes that occur in vessels of other parts of the body. So we can maintain with good reason that the blood vessels supplying the vestibular nerve and its endings may become partially or completely occluded. Such occlusion will bring about a similar hyper-sensibility of the vestibular nerve endings as occurs in the nerve endings of the skin. Normal stimuli under such conditions may evoke the sensation of vertigo of varying degrees of severity. And, even as the pain brought about by vascular occlusion may last for weeks, so we may infer that vertigo due to similar causes may last for weeks.

A lady in excellent health, despite a raised blood pressure, had a sudden attack of slight vertigo from which she recovered in a few hours. Next day, while lying in bed, she was suddenly seized with an intense attack of vertigo. She could not move her head, for the slightest movement made the vertigo more intense and caused most violent vomiting. She was confined to bed for three weeks owing to the vertigo. During the first week vomiting was of frequent occurrence. The vertigo did not entirely leave her until some months had passed. The only discomfort this patient suffered from previously was sudden attacks of pain deep in the muscles of the leg. The pain was so intense as to cause her to sweat and become faint. There was no actual cramp.

Now, the sudden onset of severe and continuous vertigo in a healthy person, which is made worse by the slightest movement of the head suggests, firstly, that its origin is vascular and secondly, that the stimulus giving rise to the sensation affects highly sensitive vestibular nerve receptors. In the case quoted the pain in the leg muscles was probably also of vascular origin, producing intense irritability of the nerve endings in the muscles.

Before leaving this aspect of the subject, I wish to relate another case which may throw a little further light on the origin of the nerve impulses giving rise to the sensation of vertigo.

A few days ago I saw a man of sixty years, with severe

arterio-sclerosis, during an attack of slight right-sided hemiparesis, with difficulty in articulation and apraxia of the speech musculature. There was a history of a previous similar attack a few hours earlier in the day, from which he had completely recovered. He was making preparation for returning to his home some distance away. On my advice he had agreed to defer his departure until next day, when suddenly he stood up and said: "I'm all right now; there is no need to stay; I will catch my train as arranged!" He walked about in his usual brisk manner, his speech became perfectly normal and he wrote out a telegram rapidly and distinctly; a minute previously he had tried to do so and failed lamentably. The change was intensely dramatic. I learned next day that he had reached home without any further untoward symptoms.

How else can we explain the symptoms in this case except on the assumption that the arteries supplying the motor cortex and probably a part of the cortex anteriorly became partly obliterated as a result of spasm; for let it be remembered that the cerebral arteries are under the influence of vasomotor control as are other arteries of the body.

Surely we may infer that spasm may affect the vessels supplying the vestibular receptors and the end result will be vertigo of sudden origin, transient duration and with recovery almost as sudden as was its onset.

If now we leave the labyrinth and consider the vestibular nerve we must not pass over the vestibular or Scarpa's ganglia. These are homologous with the ganglia on the posterior nerve root which, as is common knowledge, are frequently the seat of inflammation leading to *herpes zoster*. I do not know, but it is worthy of consideration, whether the ganglia of Scarpa may not be similarly affected. As posterior root ganglionitis leads to great pain, often persisting over long periods, so I conceive may an inflammation of Scarpa's ganglion lead to great irritation and result in persistent vertigo.

And as with the ganglia, so the trunk of the vestibular nerve may similarly be the seat of a neuritis from an infection by the ordinary route, namely the perineural lymphatics. Such a condition might lead in the early stages to vertigo to be followed later, when the degenerative changes were more evident, by loss of function, partial or complete.

Again, the nerve itself may be irritated from compression by a tumour or by a meningeal exudate due to infection by tuberculosis, syphilis or the meningococcus. The pressure here would act similarly as in the case of pressure on the posterior spinal roots, with, of course, different physiological results, pain, numbness, tingling, resulting from spinal root irritation, giddiness from the irritation of the vestibular nerve. Clinically we meet with cases of vertigo due to pressure on the vestibular nerve. A tumour of the cerebello-pontine angle by pressure causes among other symptoms disturbance of the facial, auditory and vestibular nerves and sometimes the trigeminal, giving rise to facial palsy, tinnitus and defects of hearing, vertigo, disturbances of function of the fifth nerve and secondary effects from pressure upon the pyramidal tracts. Such a syndrome of symptoms could only arise from a lesion in this situation.

(To be Continued.)